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TRANSACTIONS

OF THE

NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM,

AND

NEWCASTLE-UPON-TYNE.

(New Series)

VOLUME III.

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NEWCASTLE-UPON-TYNE:

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1908–1911.

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NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE

REPORT OF THE COUNCIL

FOR 1906–1907

During the year twenty-one ordinary members, one honorary member and two associates have been elected, but the losses by death and resignation have amounted to thirty-seven. This leaves the total membership at the close of the year at 409, or a decrease of thirteen since the date of the last report. Your Council greatly regret that they have not a more favourable state of things to report in regard to the membership. Though the decrease has not been large, it has been steady now for several years; and this, at a time when efforts are being made in several directions to extend the Society's usefulness, is decidedly discouraging. On the other hand, even during the past few months, two or three of the members have been remarkably successful in bringing in new subscribers. It can hardly be doubted that many other members could do the Society a similar service if they would call attention to the work it is doing, and to the extent to which it is hampered in this work by lack of sufficient support.

By the death of Sir John D. Milburn the Society loses one of the eleven new Trustees who were appointed only so recently as last December. The late Ald. John Dent, also, was one of the new Members of Council elected at the last Annual Meeting; it was hoped that his business ability and his enthusiastic interest in everything connected with marine natural history would have made him a valuable officer of the Society, but the illness which resulted in his death prevented him from ever attending a meeting. Another loss which the

Society has sustained, though not actually from among its members, must be recorded here, namely the death of Mr. J. E. Robson of Hartlepool. At the time of his death Mr. Robson was seeing through the press the concluding part of his excellent catalogue of the local Lepidoptera. This has been published by the Society, and is well worthy to take its place in the authoritative series of catalogues of local natural history which are contained in the Transactions. The death of the author while the work was still uncompleted is most regrettable ; but through the good offices of Mr. John Gardner, the help of Mr. Eustace R. Bankes, the chief British authority on the Microlepidoptera, has been secured, Mr. Bankes having very kindly undertaken the necessary revision of the manuscript and proofs.

The completion of the late Mr. Robson's catalogue will bring to an end the old series of Transactions, which has had to be left unfinished while the new series was proceeded with. Of this new series two volumes have now been issued. The part sent out during the past year has brought Vol. 1 to a close. Vol. 2, issued in one part the previous year, consisted of the Rev. W. J. Wingate's work on the Diptera. These two volumes have been noticed much more fully than usual in the scientific press, and it will be gratifying to members to know that this side of the Society's activity has met with such wide and favourable recognition.

As explained in the last annual report, the amount of valuable material offered for publication by the members during the preceding year had been so large that it was impossible to meet the cost of printing and issuing it out of the ordinary funds, and the Council had been compelled to appeal for the raising of a special Publication Fund. The sum received in response to the appeal was £228 12s. Finding that this sum had been subscribed from among a comparatively small proportion of the membership, and chiefly in considerable amounts, the Council issued later a further circular to those who had not already contributed, in the hope of persuading all to help the fund to however small

an extent. The further subscriptions were not numerous, however, and the additional sum realised was only £17 6s. The total amount produced by the appeal, £245 18s., was sufficient to tide over the difficulty of the moment, and the Council value the response as a proof of the real interest which is taken in the Society's work. But as the publication of Transactions, even under normal circumstances, absorbs money which can ill be spared from other objects, the Council desire to commend to the members the example of a few who have made their subscription to the Publication Fund an annual one. Such a fund permanently maintained, even if it were not large enough to meet the whole cost of the Transactions, would be a very welcome relief to the finances in general.

Another matter in connection with publications, also alluded to in the last report, is the valuable material relating to the nudibranch molluscs, left to the Society by Joshua Alder and Albany Hancock. This, as already reported, has been taken in hand by Sir Charles Eliot, whose papers on the Indian species represented among the specimens and drawings have now been published by the Zoological Society. Alder and Hancock's notes on the British species are to be issued by the Ray Society as a supplement to the great monograph by the same authors; but their publication is delayed for the present through lack of a sufficient guarantee of subscriptions. In a matter so closely connected with this Society and its traditions, your Council when approached felt that they could not do less than offer to subscribe for ten copies (£10 10s.); and they will now be glad to hear from any members who are sufficiently interested in the subject or the authors to wish to possess themselves of a copy on publication.

A heavy expense has come upon the funds during the year through the necessity of replacing one of the three boilers by means of which the museum is heated. The boiler and the work of fitting it cost altogether £81. Unfortunately, even with all three boilers in good order, the heating system of the museum is not perfect. The power is sufficient, but the

circulation is faulty, owing to the additions made to the building since the heating pipes were first installed. It is therefore impossible at present to heat the museum evenly throughout at one time. The only remedy is the laying of a new main pipe from the boilers to the front of the building, but as this could not be done at a less cost than about £50 it has had to be given up for the present. It is, however, a matter of considerable urgency, as a dry building is an absolute necessity for the safe keeping of the collections. A valuable collection of birds' eggs in the museum gives a great deal of trouble every year through the growth of mould, and this is owing to the fact that the room it is kept in cannot be properly heated in the winter. While referring to this subject, special mention must be made of the trouble taken by Mr. Ernest Scott to investigate the working of the whole hot water system and advise the Council in the matter.

An addition has been made to the staff of the museum in the appointment of an assistant to the curator. In several recent reports reference has been made to the pressing need of an increased staff to deal with the work of the museum. This need has indeed been obvious from the first. In the early years of the new museum the committee in their reports dwelt repeatedly on the inadequacy of the Society's resources to the task of maintaining and developing the fine institution which had come into their possession, and the remedy which they advocated, the raising of a substantial maintenance fund, proved impossible to carry out. The museum has consequently always been seriously understaffed; not only have the contemplated developments perforce remained for the most part unattempted, but large arrears of the most necessary work have steadily accumulated, so that, as the curator's reports have shown year by year, the care and display of all the collections in any satisfactory manner is out of the question. Though fully alive to these facts, your Council have not hitherto found it possible to deal with them in any fundamental way. This year, however, partly owing to the relief afforded by the Publication Fund, it was thought that some-

thing practical might be done. The whole question was most carefully considered at a special meeting on May 20th; and though a certain amount of risk is inseparable from such a step, the circumstances are so pressing that the Council felt justified in advertising for an assistant. From a number of candidates Mr. Herbert Fletcher, of the zoological museum at Birmingham University, was selected, and the work he has done since his arrival seems to show that a very satisfactory choice has been made.

It may here be mentioned that an insurance against employers' liability under the new Act has been effected in regard to the museum staff.

A list of the Evening Meetings held during the winter session of 1906–7 is printed at the end of the report. The attendances were rather uneven, and one or two small audiences bring the average down to about 75; but on the whole the interest shown in the meetings has been well maintained. The Christmas holiday lectures to young people were very kindly given this winter by two of the Professors at the Armstrong College, and were in every way successful. The attendance at the Curator's evening "museum talks" shows a decided improvement on previous years. Hitherto the average has been about 50, but for the past session it works out to about 65, or, if one evening on an unfortunate date be left out of account, to 73. The Council are glad to notice that two of the "talks" were given by members who volunteered to help Mr. Gill in this work; such assistance is particularly valuable when, as in these instances, it thereby becomes possible to introduce botany among the subjects dealt with.

Of the Field Meetings, which will be reported in full later in the year, it is here only necessary to say that a full programme was arranged by the Field Meetings Committee, and has been successfully carried out as far as it has gone at the date of this report.

For the Hancock Prize Competition last autumn eighteen essays were sent in, the largest number yet received in any

year. On the recommendation of the examiners, Canon Norman and Prof. Meek, the prize was awarded to Mr. G. W. Temperley for an excellent essay on "A Day with the Birds on the Northumberland Coast"; and the examiners considered that this essay was closely approached in merit by those of Mr. Frank Harrison, Miss M. R. D. Minton-Senhouse, and Mr. R. Smith.

Some of the additions made to the museum during the year call for special mention. Perhaps the most important of all is the collection of birds formed by the late Thomas Thompson of Winlaton. In his will Mr. Thompson bequeathed to the Society such of his birds as he considered to be of most value as local records, as well as certain other objects of natural history; and subsequently almost the whole remainder of his collection, including a large number of particularly well mounted specimens, was handed over to the museum by his residuary legatees. Mr. R. S. Bagnall has made a valuable addition to the reference collections in presenting a very complete series of the British woodlice. A number of well set Canadian Lepidoptera have been received through Mr. Geo. Jenkins. The herbarium of the late John Storey forms an interesting addition to the rich store of botanical material contained in the museum; John Storey was a well known botanist of the last generation, and his herbarium comes to the Society through the executors of his son. As usual, the museum has been indebted to Mr. G. E. Crawhall for various gifts; these have included during the past year a number of African weapons and several birds, the most interesting of the latter being a fine example of what is known as the Polish swan. The mineral collection has benefitted considerably through specimens acquired by donation or exchange from Mr. P. Walther. From Colonel Carr-Ellison have been received some bird skins and North American plants, and he has also deposited on loan in the museum some very good ethnological objects, chiefly weapons and utensils from New Zealand and the South Seas. Further particulars of these and other acquisitions will be found in the complete list at the end of the report.

NEW MEMBERS ELECTED

FROM JULY, 1906, TO JUNE, 1907

E. L. Beckingham, 24, Windsor Terrace, Newcastle.
Septimus Brown, Eldon Street, Newcastle.
E. C. Champness, 35, Eskdale Terrace, Jesmond.
Jos. Cobb, junr., Station Street, Sunderland.
C. D. Foster, 24, Grainger Street, Newcastle.
C. Stanley Hadaway, Washington Terrace, North Shields.
Miss Mary K. Heslop, 6, Eldon Place, Newcastle.
Dr. H. J. Hutchens, Corbridge.
John A. Irving, West Fell, Corbridge.
James Knott, Sydenham Terrace, Newcastle.
James L. Knott, junr., Beverley Terrace, Cullercoats.
George Lisle, Bentham Buildings, Side, Newcastle.
James Ed. Meikle, Beauclere, Riding Mill-on-Tyne.
Sir Walter Plummer, J.P., Queen Square, Newcastle.
Herbert J. Richardson, M.A., Westgate Chambers, Newcastle.
Mrs. Smith, Hencotes House, Hexham.
George R. B. Spain, 10, Victoria Square, Newcastle.
George W. Temperley, 4, Carlton Terrace, Low Fell.
T. W. Thompson, 117, Pilgrim Street, Newcastle.
F. T. Walker, 27, Woodbine Avenue, Gosforth.
P. Walther, Vogelweide, Forest Hall.

HON. MEMBER

Prof. G. S. Brady, M.D., LL.D., F.R.S., Park Hurst, Endcliffe, Sheffield.

ASSOCIATE MEMBERS

Thomas Bulman, 40, Wingrove Avenue, Newcastle.
J. W. Stephenson, 53, Jefferson Street, Newcastle.

CURATOR'S REPORT ON MUSEUM WORK

1906–1907

The museum work of the year can be described most conveniently under the headings of the departments in which it has been done. In the zoology room, the re-labelling of the mammals, mentioned in the last report as being in hand, has been completed, and has produced a marked improvement, furthered also by some re-arrangement of the specimens themselves. Some more work upon the shell collection has very kindly been done by Miss Lebour; during the winter she carried out a particularly valuable piece of work in sorting through all the shells in the store-cupboards. We are now engaged upon the corals. Of these the Society possesses a good collection presented in 1837 by the Earl of Tankerville, but it has long been dirty and always been poorly shown. We have now cleaned the corals, and are re-installing them in the same cases, but on a totally different system. The essential of the new plan is the use of sloping shelves of unpolished plate-glass. This was tried as an experiment, and was found to be a very good means of adapting an unsuitable case to the purpose of exhibiting corals, as the glass allows enough light to reach all parts, while at the same time itself helping to provide a background against which the beautiful forms of the corals are pleasingly thrown up.

A good deal of work has also been done in the bird room. The cleaning and painting of the cases in the Hancock collection was finished during the year, and the change for the better which it has produced is so striking that a number of visitors, not understanding how it has been brought about, have thought the birds themselves had been in some way renovated. Several fresh birds, including a swan, have been mounted by us and added to the collection; a case of birds in albino and other abnormal states of plumage has been fitted up, and a number of foreign birds have been identified from the British Museum catalogue. The birds from the late Mr. Thompson's collection are shown all together for the present at

one end of the bird room gallery. The desk cases in the bird room have also had attention. Two of them, devoted to eggs and nests, were re-fitted several years ago, and now the other two have been taken in hand and much improved, though some amount of work still remains to be done upon them. Finally, the glass covers of the groups on pedestals, in the bird room and elsewhere, have been cleaned, as have also the specimens underneath them where necessary. Owing to their great weight the larger covers were very difficult to handle, but we happily succeeded in cleaning them all without mishap. Altogether it may certainly be said that the bird room looks better at present than it has ever done before.

In the third large room, the fossil room, nothing of importance has been done during the year. There is an overwhelming amount of work in that room waiting to be taken up, but it is only by practically abandoning it for the time that we can hope to make headway with some of the really discreditable sections of the zoology room. A number of additions and some small improvements have been made in the mineral gallery. In the ethnology gallery a considerable number of fresh acquisitions have been worked in. We have also, through the kindness of Sir R. K. Douglas and Dr. Wallis Budge, been allowed to send our Burmese palm-leaf books and Babylonian inscribed bricks to the British Museum for examination, and they have been returned with information as to the content of the writings which has enabled us to label them in a much more interesting way than was possible before.

Miscellaneous work in various parts of the museum has included the renovating of some detached cases, such as those of the Japanese giant crab and the polar bear, and a large amount of inspection and overhauling of reference collections. Other matters upon which a good deal of time has been spent are the editing of transactions and the preparation of the library catalogue. Miss Welford has now made a typewritten copy of the catalogue, and has re-arranged the books in accordance with it; and she is at present preparing an author-

index. Various classes, societies, and other parties of people have paid visits to the museum during the year, and as usual I have given to most of them either general information about the collections or a more definite address on some particular subject.

I wish to record my thanks to the Rev. W. McLean Brown and Mr. Richard Adamson for their kindness in giving two of the "museum talks" during the past winter, and to Mr. P. Walther for the help he has given me in various matters connected with the mineral collection.

In my two last reports I have emphasised the inadequacy of our means for dealing with the work of the museum, and have particularly laid stress upon the need of an increased staff. I must therefore now express my pleasure at the action of the Council in engaging a skilled assistant to help me, and in the fact that Mr. Fletcher gives every promise of being a valuable addition to our working strength. The staff will still be too small to manage the museum really creditably, quite apart from the carrying out of the many valuable developments of which the institution is capable; but this addition will at least make itself felt in the rate at which we are able to overtake the more pressing arrears of work, with which our progress up to the present has been so discouragingly slow.

E. Leonard Gill.

APPENDIX

Subjects of "Museum Talks," 1906–07

Oct. 31.—Some Recent Acquisitions.

Nov. 28.—Elephants and Ivory.

Dec. 31.—Some Plants of the Bible (Rev. W. McLean Brown).

Jan. 30.—History in Rocks and Fossils (materials of the geological record).

Feb. 27.—Some "Living Fossils" (survivals from past periods of the earth's history).

Mar. 27.—Some Remarkable Foreign Birds.

Apr. 24.—The Daisy and its Relatives (Mr. Richard Adamson).

NATURAL HISTORY SOCIETY OF NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE

HONORARY OFFICERS OF THE SOCIETY

Elected at the Annual Meeting, October 10th, 1906

PRESIDENT

The Right Hon. Lord Armstrong, M.A., D.C.L.

VICE-PRESIDENTS

The Duke of Northumberland.
Viscount Ridley.
Lord Barnard.
Lord Ravensworth.
Lord Joicey.
The Bishop of Durham.
The Bishop of Newcastle.
Sir Hugh Bell, Bart.
Sir Arthur Middleton, Bart.
Sir Andrew Noble, Bart., F.R.S.
Sir Isambard Owen, M.A., M.D.
Sir G. H. Philipson, M.D., D.C.L.
Sir John Swinburne, Bart.
Sir Lindsay Wood, Bart.
The Lord Mayor of Newcastle.
Lt.-Col. C. H. E. Adamson, C.I.E.
Col. W. M. Angus, C.B.
Prof. G. S. Brady, M.D., F.R.S.
E. J. J. Browell.
R. C. Clephan, F.S.A.
Norman C. Cookson.
Geo. E. Crawhall.
W. D. Cruddas.
R. R. Dees.
D. O. Drewett.
Samuel Graham.
H. N. Middleton.
John Pattinson, F.I.C.
Prof. M. C. Potter, M.A.

COUNCIL

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W. E. Beck.
Harry Benson.
Rev. W. McLean Brown.
Clive Cookson.
John Dent.
Wilfred Hall.
George Jenkins.
Prof. Alex. Meek, M.Sc.
J. Alaric Richardson.
Ernest Scott.
C. E. Stuart, B.Sc.

HON. SECRETARIES

N. H. Martin, F.R.S.E. | C. E. Robson.

HON. TREASURER

A. H. Dickinson.

HON. AUDITOR

Samuel Graham.

MUSEUM STAFF

CURATOR .....E. LEONARD GILL, M.Sc.

ASSISTANT.....HERBERT FLETCHER.

LADY ASSISTANT AND SECRETARY.....MISS E. WELFORD.

ATTENDANT .....WILLIAM VOUTT.

GARDENER.....ALBERT SPENCER.

EVENING MEETINGS HELD DURING THE WINTER SESSION, 1906–1907

Nov. 14.—Mr. W. H. Young, F.L.S., F.Z.S. : "Extinct Animals" ; chair taken by Lieut.-Col. C. H. E. Adamson, C.I.E.

Dec. 19.—Prof. M. C. Potter, M.A. : "The Structure and Decay of Timber" ; chair taken by Mr. J. Alaric Richardson.

Jan. 16.—Dr. Robert Anderson : "Local Pond Life" ; chair taken by Mr. John Pattinson, F.I.C., F.C.S.

Feb. 13.—Mr. Richard Adamson : "Some Familiar Wild Flowers of the District" ; chair taken by Mr. W. Mark Pybus.

Mar. 13.—Mr. Harry Eltringham, M.A., F.E.S., F.Z.S. : "African Mimetic Butterflies" ; chair taken by Lieut.-Col. C. H. E. Adamson, C.I.E.

April 10.—Rev. A. J. Campbell : "The Moss Plant : an Exposition" ; chair taken by Rev. W. McLean Brown.

AFTERNOON LECTURES TO CHILDREN

Dec. 27.—Prof. Alex. Meek, M.Sc., F.Z.S. : "The Natural History of Laziness" ; chair taken by Mr. Ernest Scott.

Jan. 3.—Prof. G. A. Lebour, M.A. : "Volcanoes, Living and Dead" ; chair taken by Mr. N. H. Martin, F.R.S.E., F.L.S., F.C.S.

LIST OF SUBSCRIPTIONS TO PUBLICATION FUND

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The Right Hon. Lord Armstrong ...	10	10	0
Sir Andrew Noble, Bart.	10	10	0
Geo. E. Crawhall, Esq...	10	10	0
W. D. Cruddas, Esq. ...	10	10	0
Lt.-Col.C.H.E.Adamson	10	0	0
D. O. Drewett, Esq. ...	10	0	0
Wilfred Hall, Esq. ...	10	0	0
The Right Hon. Lord Joicey	10	0	0
Mrs. Punshon	10	0	0
Sir Lindsay Wood, Bart.	10	0	0
Col. H. F. Swan ...	5	5	0
The Right Hon. Lord Barnard	5	0	0
E. J. J. Browell, Esq. ...	5	0	0
Norman C. Cookson, Esq.	5	0	0
H. N. Middleton, Esq...	5	0	0
Major George Noble ...	5	0	0
His Grace the Duke of Northumberland ...	5	0	0
John C. Straker, Esq. ...	5	0	0
Jos. H. Straker, Esq. ...	5	0	0
Sir Hugh Bell, Bart. ...	3	3	0
Thomas Bell, Esq. ...	3	3	0
J. H. B. Noble, Esq. ...	3	3	0
John Pattinson, Esq. ...	3	3	0
W. E. Beck, Esq. ...	2	2	0
J. G. Bell, Esq. ...	2	2	0
R. C. Clephan, Esq. ...	2	2	0
Clive Cookson, Esq. ...	2	2	0
Axel. F. Ericsson, Esq...	2	2	0
T. E. Hodgkin, Esq. ..	2	2	0
N. H. Martin, Esq. ...	2	2	0
H. T. Mennell, Esq. ...	2	2	0
Sir John D. Milburn ...	2	2	0
J. R. Perrett, Esq. ...	2	2	0
John E. Rogerson, Esq..	2	2	0
Mrs. A. Thompson ...	2	2	0
Dr. C. O. Trechmann ...	2	2	0
John D. Walker, Esq....	2	2	0
Rev. Arthur Watts ...	1	5	0
Richard Adamson, Esq...	1	1	0
R. S. Bagnall, Esq. ...	1	1	0
T. W. Bagnall, Esq ...	1	1	0
Chas. L. Bell, Esq. ...	1	1	0
The Hon. Francis Bowes-Lyon	1	1	0
Hereward Brackenbury, Esq.	1	1	0
Sir Gainsford Bruce ...	1	1	0
J. M. Bruce, Esq. ...	1	1	0
Jas. T. Cackett, Esq. ...	1	1	0
Wm. Cochran Carr, Esq.	1	1	0
Thos. Crawford, Esq. ...	1	1	0
John Dent, Esq. ...	1	1	0
A. H. Dickinson, Esq....	1	1	0
Dr. C. J. Gibb	1	1	0
Samuel Graham, Esq. ...	1	1	0
Wm. Harrison, Esq. ...	1	1	0
Max Holzapfel, Esq. ...	1	1	0
Sir J. D. Hooker ...	1	1	0
G. P. Hughes, Esq. ...	1	1	0
Miss M. V. Lebour ...	1	1	0
W. Ridley Makepeace, Esq.	1	1	0
J. Ford Maling, Esq. ...	1	1	0
Geo. W. McLean, Esq...	1	1	0
Prof. D. Oliver	1	1	0
Thos. Pumphrey, Esq....	1	1	0
J. Alaric Richardson, Esq.	1	1	0
Dr. W. G. Richardson...	1	1	0
C. E. Robson, Esq. ...	1	1	0
Robert Robson, Esq. ...	1	1	0
Ernest Scott, Esq. ...	1	1	0
Thomas Simpson, Esq...	1	1	0
Geo. S. Smart, Esq. ...	1	1	0

	£	s.	d.
C. E. Stuart, Esq. ...	1	1	0
Miss Jessica Thompson..	1	1	0
John G. Weeks, Esq. ...	1	1	0
Frank Winter, Esq. ...	1	1	0
Wilson Worsdell, Esq....	1	1	0
Jas. S. Forster, Esq. ...	1	0	0
John A. Irving, Esq. ...	1	0	0
Mrs. H. M. Pease ...	1	0	0
G. Beigh Richardson, Esq.	1	0	0
Sir John Swinburne, Bart.	1	0	0
John D. Addison, Esq...	0	10	6
W. L. Anderson, Esq. ...	0	10	6
Jos. G. Angus, Esq. ...	0	10	6
Rev. W. McLean Brown	0	10	6
Dr. J. C. J. Fenwick ...	0	10	6
George Hadaway, Esq...	0	10	6
R. Oliver Heslop, Esq...	0	10	6
Dr. A. Randell Jackson.	0	10	6
Matthew Mackay, Esq...	0	10	6
Edward Potts, Esq. ...	0	10	6
James Stephenson, Esq..	0	10	6
John Wilson, Esq. ...	0	10	6
Geo. A. Atkinson, Esq..	0	10	0
T. H. Atkinson, Esq. ...	0	10	0
H. F. Bulman, Esq. ...	0	10	0
George Jenkins, Esq. ...	0	10	0
Thomas Jones, Esq. ...	0	10	0
A. B. Park, Esq. ...	0	10	0
George Sisson, Esq. ...	0	10	0
W. H. Young, Esq. ...	0	10	0
Isaac Clark, jun., Esq...	0	5	0
Jos. Cobb, Esq. ...	0	5	0
George Nicholson, Esq..	0	5	0
David Rosie, Esq. ...	0	5	0
R. B. Cooke, Esq. ...	0	2	6
Alfred Woodcock, Esq...	0	2	6

LIST OF DONATIONS

FOR THE YEAR ENDING JUNE 30TH, 1907

DR. A. A. ABRAHAM.—Four birds (hooper, bean goose, bittern, and a tyrant-flycatcher) formerly belonging to the late Edmund Crawshay.

LIEUT.-COL. C. H. E. ADAMSON, C.I.E.—Two Indian rollers, *Coracias indicus*. Two examples of compressed air fire-making tackle used by the Chins.

CAPT. H. H. ADAMSON (per Col. Adamson). —A large moth *(Erebus strix?)* from Manâos on the Amazon.

RICHARD S. BAGNALL, F.E.S.—A practically complete collection of British woodlice. Also a series of specimens showing growth-stages of caterpillars, and a number of rare and newly discovered local insects, indigenous and imported, including ants, beetles, hemiptera, etc.

CHAS. L. BELL, J.P.—A pair of swallows from Woolsington.

MISS BELL (Harlow Hill).—A black guillemot, *Uria grylle*, in full breeding plumage, mounted.

ROBT. BLAIR, F.S.A.—Some fossils, including a fine tooth of *Carcharodon* and other sharks' teeth, a number of fossil shells, etc.

K. RUSSELL BRADY.—Native model of a surf-boat or katamaran.

MRS. BREWIS.—A fine piece of Japanese carving in red wood. Two parson-birds, *Prosthemadera novæ-zealandiæ*, with some other foreign birds.

M. WALTON BROWN.—Specimens of witherite from Brancepeth Colliery. Samples of various ores—pisolitic iron ore, bole, lithomarge, bauxite, etc.

LIEUT.-COL. R. H. CARR-ELLISON.—A number of bird skins collected in Malta and near Hong Kong by the late Capt. Oswald Carr, R.A. Grasses, leaves of trees, and other botanical specimens of economic interest from North America. Also, deposited on loan, 37 ethnological objects, chiefly from New Zealand and the South Sea Islands ; these objects include several flat Maori weapons of wood, bone and stone, and the basket-work of a Hawaiian feather helmet.

ALEX. CHEAL.—Several bullfinches from Surrey.

Isaac Clark, junr.—Natural history objects from South Africa, including two nests of a weaver bird, *Hyphantornis spilonotus*, some millipedes, etc. Also a pair of malformed horns of axis deer.

Mrs. Cochrane.—A living brush-tailed rat-kangaroo, *Bettongia penicillata*, from Australia.

Geo. E. Crawhall.—The following birds from near Haydon Bridge: two teal drakes, one in full plumage and one in "eclipse"; a female wigeon, and a fine example of the "Polish swan," *Cygnus immutabilis*. Some ethnological objects, viz., a number of weapons from the Congo and a Mohammedan sword and sheath from Sierra Leone.

D. O. Drewett.—A mouse of a domesticated breed found wild at Dilston.

Geo. Duncan.—A specimen of the longicorn beetle *Astynomus ædilis*, found at Redheugh Gas Works.

A. L. Forster.—Two unusual varieties of the eggs of the black-headed gull, from Hallington.

Geo. Gardiner.—A large ichneumon fly *(Ephialtes manifestator?)* found in the town.

E. L. Gill.—Two vertebræ of Ichthyosaurus, respectively from the Oxford clay of Peterborough and the Lower Lias of Leicestershire.

Samuel Graham.—Some nests with eggs to add to the exhibited collection, and a number of sea-birds' eggs, including very good series of several of the gulls.

Sir Charles Hammond (family of the late).—Two cases, containing a pair of blackgame and a pair of pheasants.

Jas. B. Harris.—Polished samples of ornamental Devonshire marbles.

Mrs. Hedley.—A small Turkey cup-sponge, *Euspongia officinalis* var. *mollissima*, attached in position of growth.

H. B. Herbert, B.A. (Berkhamsted.)—Three examples of *Abraxas ulmata* and two of *Asthena pulchraria* from Buckinghamshire.

Matthew P. Ismay.—A case of dried crustacea and other shore animals.

Geo.. Jenkins.—A number of North American Lepidoptera, about 200 specimens, well set.

Irving Jones.—Piece of poplar log from the Souris River, Canada, showing cutting done by teeth of beavers.

Coun. Matthew Lee (Frosterley.)—A large tropical spider *(Mygale* or *Avicularia sp.)* found alive in a bunch of bananas at Frosterley, Weardale.

L. Lovibond.—Two eggs, a black tern's and a variety of the peewit's.

B. B. Mewburn.—Nest of rock pipit from St. Kilda.

John Pattinson, F.I.C.—A piece of fossiliferous Middle Lias.

Mrs. Pelegrin.—A group of 19 tropical birds under a shade.

Messrs. F. H. Phillips and Co.—An example of a rare fish, the greater forkbeard, *Phycis blennoides (= furcatus)*, landed at Sunderland.

Jas. S. Pitkeathley.—A good mounted specimen of the Indian cobra, *Naia tripudians*.

Mr. and Mrs. W. W. Proctor. — Two Continental cockchafers, *Polyphylla fullo*, Fabr., from Ostende.

C. H. Reed.—A piece of encrinite stem from the boulder clay near St. Mary's Island. Also (with Jno. Duncan) a starfish, *Solaster papposa*, from the same part of the coast.

F. W. Rich.—Five specimens of Planer's Lamprey, *Petromyzon planeri*, Cuv., from the Coquet, near Hepple.

T. B. Short (Berwick.)—A black-headed Gouldian-finch, *Poephila gouldiæ*.

Geo. Sisson.—An "American silkworm moth," *Saturnia cecropia*, with the cocoon.

Laurence Smith.—Fresh comb from a wild bee's nest, Shetland.

R. J. Stopher.—An emu's egg brought from Australia by the donor.

Theophilus Storey (Executors of the late).—The herbarium of the late John Storey (father of Theophilus Storey). The plants are in excellent preservation.

Andrew Thomson.—An example of an arctic cat-fish, the "jelly-cat," *Anarrhichas denticulatus (= latifrons)*, said to have been caught off the Northumberland coast ; not previously recorded from British seas. (See *Transactions*, new series, vol. 1, p. 499.)

Thomas Thompson (the late).—By bequest : eight birds in his collection which he judged to be most valuable to the Museum, including local examples of the great reed warbler, great crested grebe, bittern, etc. ; together with some local nests, and a collection of small British birds (about 80 cases) made by Thos Robson. Also a pine marten from Scawfell, and the tooth of a mammoth.

THOMAS THOMPSON (Residuary Legatees of the late).—Nearly all the remaining birds in the late Mr. Thompson's collection, including particularly fine and well mounted examples of shearwater, chestnut variety of partridge, grey plover, stockdove, nightjar, spotted woodpecker, Greenland and Iceland falcons, etc.

MRS. FLORENCE T. C. TREVELYAN.—A number of Indian horse-trappings.

J. D. WALKER, J.P.—Two local birds, a short-eared owl and a Richardson's skua.

W. WALKER (Amble.) - Examples of small slickensided knots, simulating vegetable structures, in Coal Measure shale from Amble.

P. WALTHER.—A number of minerals and fossils, including foliaceous specular iron ore, moresnetite, Persian soapstone, carved soapstone, various asphalts, chrysotile from Bassenthwaite, a fine example of vein-infilling from the Harz, corals from the Eifel, fossil wood and various species of belemnites from the Yorkshire coast. A quantity of ozocerite for mounting crystals ; a tin of an invisible varnish for protecting shale fossils from sulphur-decomposition. A Spanish leather wine bottle ; a grotesque "mermaid" from Japan. Also, a number of good minerals acquired from Mr. Walther by exchange.

MRS. WARD.—A hen whydah bird, *Vidua paradisea*, mate of a cock presented last year.

MISS E. WELFORD.—A very small egg laid by a domestic hen (about the size of a corn bunting's.)

JAS. WILKINSON.—Two fresh eggs of a tortoise.

MISS RUTH WOOD.—A miniature egg laid by a full grown hen.

ADDITIONS TO THE LIBRARY

BY DONATION AND EXCHANGE

From JULY 1st, 1906, to JUNE 30th, 1907

BRITISH SOCIETIES AND INSTITUTIONS

Berwick-upon-Tweed:—Berwickshire Naturalists' Club.

History of the Club, vol. 19, part 2.

Bradford:—Natural History and Microscopical Society.

Recorders' Reports for 1906.

Cambridge University:—Philosophical Society.

Proceedings, vol. 13, part 6; vol. 14, parts 1–2.

Report for 1905.

Cardiff:—Museum and Art Gallery.

Reports of the Welsh Museum for 1906 and 1907.

Colchester:—Corporation Museum.

Report for 1905–6.

Dublin:—Royal Dublin Society.

Transactions, vol. 9, parts 4–5.

Scientific Proceedings, vol. 11, N.S., nos. 10–15.

Economic Proceedings, vol. 1, nos. 8–9.

Edinburgh:—Botanical Society.

Transactions and Proceedings, vol. 23, part 2.

Glasgow:—Natural History Society.

Transactions, vol. 7, N.S., parts 2-3.

Greenwich:—Royal Observatory.

Results of the Magnetical and Meteorological Observations, 1904 and 1905.

Reduction of Meteorological Observations, part 4.

Liverpool:—Literary and Philosophical Society.

Proceedings, vol. 59.

Liverpool:—Liverpool University: Institute of Commercial Research in the Tropics.

Quarterly Journal, vol. 1, no. 3; vol. 2, no. 4.

Catalogue of the Aburi Gardens.

Lectures on Maize, Cocoa, and Rubber.

London :—British Association for the Advancement of Science.
Report of 76th Meeting, York, 1906.

London :—British Museum (Natural History), South Kensington.
Catalogue of Homoptera, part 1.
,, ,, Tertiary Vertebrata of the Fayûm, Egypt.
,, ,, Lepidoptera Phalænæ, vol. 6, text and plates.
,, ,, Madreporaria, vol. 6.
Illustrations of British Blood-sucking Flies, 1906.
List of Casts of Fossils.
Guide to Exhibition of Old Natural History Books.
,, History of Plant Classification.

London :—County Council : Horniman Museum.
Handbook, no. 7.

London :—Quekett Microscopical Club.
Journal, ser. 2, vol. 9, no. 59 ; vol. 10, no. 60.

London :—Zoological Society.
Proceedings, 1906, in 4 parts ; 1907, part 1,
Transactions, vol. 17, part 6.

Manchester :—Literary and Philosophical Society.
Memoirs and Proceedings, vol. 51, parts 1–3.

Manchester :—Manchester Museum, The University.
Notes, nos. 20, 21.
Report, 1905–6.

Newcastle-on-Tyne :—North of England Institute of Mining and Mechanical Engineers.
Transactions, vol. 52, part 1 ; vol. 54, part 9 ; vol. 55, part 6 ; vol. 56, parts 3–4 ; vol. 57, parts 2–3.
Annual Report, 1905–6.

Newcastle-on-Tyne :—Armstrong College.
Calendar, 1906–7.

Newcastle-on-Tyne :—Northumberland Sea Fisheries Committee.
Report on the Scientific Investigations for 1905.

Northampton :—Northamptonshire Natural History Society and Field Club.
Journal, vol. 13, nos. 105–108.

Norwich :—Norfolk and Norwich Naturalists' Society.
Transactions, vol. 8, part 2.

Norwich :—Castle Museum.
Report for 1906.

Plymouth :—Plymouth Institute.
Report and Transactions, vol. 14, part 3.

Plymouth :—Municipal Museum and Art Gallery.
Seventh Annual Report, 1905–6.

Southport :—Society of Natural History.
Tenth and Eleventh Reports, 1904–5 and 1905-6.
Handbook of the Town and district, with maps.

Stone, Staffs. :—North Staffordshire Field Club.
Annual Report and Transactions, vols. 40-41.

Stratford, Essex :—Essex Field Club.
"The Essex Naturalist," vol. 14, parts 5–7.

Worcester :—Public Library, Museum, and Art Gallery.
Report of Committee, 1905–6.
Index to Flora, Fauna, Geology and Antiquities.

York :— Yorkshire Philosophical Society.
Annual Report for 1906.

COLONIAL SOCIETIES AND INSTITUTIONS

Cape Town :—South African Museum.
Report for 1905.
Annals, vol. 4, part 7 ; vol. 5, parts 3–4.

Halifax, Nova Scotia :—Nova Scotian Institute of Science.
Proceedings and Transactions, vol. 2, part 2.

Melbourne :—National Museum.
Memoirs of the National Museum.

Ottawa :—Department of the Interior.
Three maps.

Ottawa :—Geological Survey of Canada.
Annual Report, vols. 14 and 15, N.S.
Palæozoic Fossils, vol. 3, part 4.
Summary Report (No. 947) for 1905.
,, ,, (No. 959) for 1906.
Annual Report (No. 928) Section of Mines for 1904.
Report of the Chibougamau Mining Region for 1905.
Preliminary Report on the Rossland B.C. Mining District.
Fifty-seven Geological Survey Maps.

Sydney, N.S.W. :—Australian Museum.

Report of Trustees for 1906.
Records, vol. 6, nos. 3 and 4.

Victoria :—Public Library, Museum and National Gallery.

Book of the Library, Museum and Gallery, 1856-1906.
Catalogue of the Collection of Curious Books, &c.
Address by the President.

Western Australia :—Geological Survey.

Bulletin, nos. 21 and 22, with 5 maps of Gold Mines.

AMERICAN SOCIETIES AND INSTITUTIONS

UNITED STATES OF AMERICA

Boston :—Society of Natural History.

Proceedings, vol. 32, nos. 3–12 ; vol. 33, nos. 1–2.
Occasional Papers, no. 7, parts 4–7.

Boston :—American Academy of Arts and Sciences.

Proceedings, vol. 41, nos. 30–35, and vol. 42, nos. 1–28.
Memoirs, vol. 12, no. 4.

Brooklyn, N.Y. :—Institute of Arts and Sciences.

Science Bulletin, vol. 1, nos. 4, 8, 9, 10.
Cold Spring Harbor Monographs, no. 6.

Buffalo :—Society of Natural Sciences.

Bulletin, vol. 8, no. 4.

Cambridge :—Museum of Comparative Zoology, Harvard College.

Bulletin, vol. 43, no. 5 ; vol. 49 ; vol. 50, nos. 2–9 ; vol. 51, no. 1.
Bulletin, Geological Series, vol. 8, no. 4.
Memoirs, vol. 30, no. 3 ; vol. 34, no. 1 ; vol. 35, no. 1.
Annual Report of the Curator, 1905-06.

Chicago :—Field Museum of Natural History.

Publication, nos. 111–114.
Botanical Series, vol. 2, nos. 4, 5.
Geological Series, vol. 3, no. 5.
Report, vol. 3, no. 1.

New York :—Academy of Sciences.

Annals, vol. 16, part 3 ; vol. 17, part 1.

Philadelphia :—Academy of Natural Sciences.

Proceedings, vol. 58, parts 1–3 ; vol. 59, part 1.

Philadelphia:—American Philosophical Society.

Proceedings, vol. 45, nos. 182–184.

Transactions, vol. 21, part 3.

Record of the Franklin Bicentennial Celebration.

St. Louis:—Academy of Science.

Transactions, vol. 15, no. 6; vol. 16, nos. 1–7.

Washington:—Carnegie Institution of Washington.

Publications nos. 5, 6, 48, 52.

Washington:—Library of Congress.

Report for 1906.

Washington:—Smithsonian Institution.

Annual Report for 1905.

Miscellaneous Collections, vol. 49, part 2; Quarterly Issue, vol. 2, part 3.

Contributions from the U.S. National Herbarium, vol. 10, parts 1 and 2; vol. 11; vol. 20, part 3.

Washington:—Smithsonian Institution, U.S. National Museum.

Reports of U.S. National Museum, 1905, 1906.

Bulletin, no. 56, part 1.

Proceedings, vols. 30, 31.

Reprint—"Directions for Collectors of American Basketry" (Mason).

,, "Instructions to Collectors of Historical and Anthropological Specimens" (Mason).

,, "Remarks on the type of the fossil Cetacean *Agorophius pygmæus*" (Müller).

Washington:—United States Geological Survey.

27th Annual Report, 1905–6.

Mineral Resources of the U.S., 1905.

Monograph, 50.

Bulletins, 275, 277–280, 282–286, 288–293, 295, 297–299, 301–303, 305–307, 310.

Professional Papers, 45–47, 49–52, 54–55.

Water-supply Papers, nos. 153, 155, 157–166, 168, 176, 178, 181–189

SOUTH AMERICAN STATES, ETC.

Mexico:—Instituto Geologico.

Boletin, num. 22 and 24.

Montevideo, Uruguay:—Museo Nacional.

Anales, vol. 6, tomo 3.

EUROPEAN SOCIETIES AND INSTITUTIONS

Bergen :—Bergens Museum.

Aarbog, 1906, hefte 1, 2, 3 ; 1907, hefte 1.

Aarsberetning for 1906.

Crustacea of Norway (G. O. Sars), vol. 5, parts 13–16.

Meeresfauna von Bergen, hefte 2, 3.

Christiania :—Videnskabs-Selskabet.

Forhandlinger, 1905.

Copenhagen :—Naturhistoriske Forening.

Videnskabelige Meddelelser, 1906.

Frankfurt-am-Main : — Senckenbergische Naturforschende Gesellschaft.

Bericht, 1905-6.

Helsingfors :—Societas pro Fauna et Flora Fennica.

Acta, vols. 27 and 28.

Meddelanden, parts 31 and 32.

Kiew, Russia :—Société des Naturalistes.

Mémoirs, tome 20, part 2.

Paris :—Muséum d'Histoire Naturelle.

Bulletin, 1906, nos. 1-6 ; 1907, nos. 1, 2, 3, and 7.

Rennes :—Université de Rennes.

Travaux Scientifiques, tome 4, 1905.

Stockholm :—Kongliga Svenska Vetenskaps-Akademien.

Les Prix Nobel en 1904, and Supplement.

Handlingar, vol. 40, no. 5 ; vol. 41, nos. 1–7 ; vol. 42, no. 1 ; vol. 43, nos. 2–4.

Arsbök, 1906.

Arkiv for Botanik, vol. 6, nos. 1–2.

,, Zoologi, vol. 3, no. 2.

,, Matematik, Astronomi och Fysik, vol. 3, nos. 1–2.

,, Kemi, Mineralogi och Geologi, vol. 2, no. 3.

Meddelanden, vol. 1, nos. 3–6.

Trencsen :—Naturwissenschaftlicher Verein.

Jahresheft, 1904–5.

Upsala :—Geological Institution, University of Upsala.

Bulletin, vol. 7, parts 13–14.

Vienna :—K. k. zoologisch-botanische Gesellschaft.

Verhandlungen, Bd. 56.

MISCELLANEOUS

Reprints of papers by Sir Chas. Eliot, K.C.M.G. :—

"Notes on some British Nudibranchs."

"The Nudibranchs of Southern India and Ceylon, with special reference to the drawings of Kelaart and the collections belonging to Alder and Hancock preserved in the Hancock Museum at Newcastle-on-Tyne." (2 papers).

Presented by the Author.

"The Fish River Bush, South Africa, and its Wild Animals," by Dr. W. T. Black (Edinburgh). *Presented by the Author.*

"Sundry Geological Problems," by G. Henriksen (Christiania). 2 copies.

Presented by the Author.

Reprints of papers by Charles Janet (Paris) :—

"Anatomie de la Tête du *Lasius niger*."

"Remplacement des Muscles vibrateurs du Vol par des Colonnes d'Adipocytes, chez les Fourmis, après le vol nuptial."

Presented by the Author.

Manchester Museum, The University, Manchester :—

Reports 1895–1905.

12 Museum Handbooks.

Supplementary List of Type Specimens in the Geological Department.

Notes from the Manchester Museum, 1-5, 8–14, 16-19.

Presented, per Dr. W. E. Hoyle.

Copy of a review by Prof. T. Rupert Jones, F.R.S. :—

"A Monograph of the Foraminifera of the Permo-Carboniferous Limestones of New South Wales."

Presented by the Author.

Reprint of paper by Miss M. V. Lebour, M.Sc. :—

"Three Mollusk-infesting Trematodes."

Presented by the Author.

Reprint of paper by H. W. Seton-Karr :—

"Flint Implements of the Fayûm, Egypt."

Presented by the Author.

Rev. W. Johnson, F.L.S.—"The North of England Lichen-Herbarium," fasciculus 10, nos. 361–400. *Purchased.*

Alder and Hancock.—"British Tunicata," vol. 2.

From the Ray Society (by subscription).

"Museums Journal," July, 1906, to June, 1907.

From the Museums Association (by subscription).

"Nature," July 1st, 1906, to June 30th, 1907.

Presented by the Publishers.

THE HONORARY TREASURER IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY

CURRENT ACCOUNT FROM 1ST JULY, 1906, TO 30TH JUNE, 1907

RECEIPTS.	£	s.	d.
Balance, June 30th, 1906	42	14	5
Members' Subscriptions	360	5	0
Museum Admission Fees	154	5	11
Sale of Guide Books	5	13	2
Interest on Investments	125	17	6
	£688	16	0

PAYMENTS.	£	s.	d.
Salaries	442	4	10
Advertising	9	0	4
Fuel, Lighting, and Water	47	10	0
Insurance	26	0	1
Materials and Fittings	20	10	6
Postage and Carriage	14	13	7
Printing	35	11	10
Property Tax	9	3	4
Building Repair Fund	45	0	0
Stationery	3	18	10
Sundries	30	6	10
Balance at June 30th, 1907	4	15	10
	£688	16	0

BUILDING REPAIR FUND

1906.	£	s.	d.
To Balance	36	2	7
,, Cash	45	0	0
,, Balance overdrawn	5	5	0
	£86	7	7

	£	s.	d.
By Dinning and Cooke (new boiler)	81	0	0
,, Sundries	5	7	7
	£86	7	7

SAML. GRAHAM, Hon. Auditor.

A. H. DICKINSON, Hon. Treasurer.

SPECIAL PUBLICATION ACCOUNT

	£	s.	d.
To Members' Subscriptions to June 30th, 1907 ...	225	8	0
,, Sale of Society's Transactions.....	3	0	9
,, Interest on Account	1	18	6
	£230	7	3

	£	s.	d.
By J. Bell and Co. (printing)*	124	16	6
,, Sundries	9	14	5
,, Balance in Bank June 30th, 1907	95	16	4
	£230	7	3

* In addition to this there is an outstanding liability for printing for £68 14s. 6d. (paid 18-7-07).

INVESTMENTS

The following is a list of the Investments held by the Society, June 30th, 1907 :—

	£	s.	d.
Newcastle Corporation Irredeemable Stock at 3½ per cent.	2,000	0	0
River Wear Commission Funded Debt at 4½ per cent.	500	0	0
Tyne Commissioners' Consolidated Fund at 4 per cent	2,000	0	0
	£4,500	0	0

SAML. GRAHAM, Hon. Auditor.

A. H. DICKINSON, Hon. Treasurer.

Trematodes of the Northumberland Coast, No. II. By Marie V. Lebour, M.Sc., Armstrong College, Newcastle-upon-Tyne.

(Plates I.-III.)

Further research among the marine Mollusca and Crustacea of Northumberland has produced several new larval Trematodes. Six were already described from *Paludestrina stagnalis**; to these I now add a seventh. This, however, by no means completes the list of those Trematodes which have their home in this small mollusk, for at least three more have been seen; but owing to their bad preservation I am unable yet to describe them.

The species referred to above belongs to the genus *Gymnophallus*, Odhner. Another cercaria belonging to this genus was found in the little bivalve *Macoma balthica*, and a third in *Tellina tenuis*. The last has been recorded before by me†, but, following Giard‡, I referred it to *Brachycœlium*. In a later paper Giard§ shows that it belongs to *Gymnophallus*, and it certainly possesses all the characteristics of the larval forms of that genus.

Another cercaria previously described by Villot‖, and recently by Pelseneer**, has been found in *Scrobicularia tenuis*. Besides those from Mollusca, several larval Trematodes have been detected in Crustacea. All so far observed in Crustacea belong to the genus *Spelotrema*, Jägerskiöld, and

* "Larval Trematodes of the Northumberland Coast," by the writer, Trans. Nat. Hist. Soc. Northbd., etc., N.S., Vol. I., p. 437, 1907.

† "Notes on Northumbrian Trematodes," Northbd. Fish. Rep. for 1905, p. 7.

‡ *Giard, A.* "Sur un Distome (*Brachicœlium* sp.) parasite des Pélécypodes," Comptes rendus des séances de la Société de Biologie, 1897, p. 956.

§ *Giard, A.* "Sur les Trématodes margaritigènes du Pas de Calais," Comptes rendus des séances de la Société de Biologie, T. LXIII., p. 416, 1907.

‖ *Villot,* "Organisation et Développement de quelques espèces de Trématodes endoparasites marins," Ann. des. Sci. Nat., Zool., 6 Ser., T. VIII., 1879, p. 18.

** *Pelseneer, P.,* "Trématodes parasites de Mollusques marins," Bulletin scientifique de la France et de la Belgique, T. XI., p. 173.

are in the encysted stage. Unfortunately very little structure could be made out in these, as they were in an early stage of development, and usually only the suckers and intestine were clearly seen. Although these have not been fully worked out, I give figures and some measurements of them as a help to future work.

As in my previous paper, I have given provisional names to the larval forms for convenience.

Genus GYMNOPHALLUS, Odhner*.

Cercaria glandosa, nov. (Plate I., fig. 1). I have given the name *glandosa* to this cercaria because of the large and characteristic glands in the head region. It occurs singly and free in the body of its host, *Paludestrina stagnalis*. I have not found it encysted, neither have I been able to find any sporocysts from which, one is justified in inferring by analogy, they are developed : the redia stage being probably omitted as in the case of the ' Pearl Trematodes ' of the Mussel, *Mytilus edulis*, the young cercaria (according to Jameson†) occurring in sporocysts in *Cardium edule* and in *Tapes decussata*. It seems doubtful whether the present cercaria has been developed in sporocysts already in *Paludestrina stagnalis*, or has migrated from some other mollusk ; the latter alternative is perhaps the more probable owing to the small number of specimens in each individual shell. So far as I am aware this is the first larval *Gymnophallus* found in a Gastropod, all those hitherto known occurring in Pelecypods, *e.g.*, *Cardium edule*, *Mytilus edulis*, *Tapes decussata*, *Saxicava rugosa*, *Tellina tenuis*, *Donax vittatus*, etc.

Cercaria glandosa is oval, and measures 0·20 mm. in length when at rest. It can however be much longer or much shorter when moving. It is tailless ; the body is covered all over with small spines and is very transparent, except in the head region, where opaque glands are conspicuous. The oral sucker

* *Odhner*, *T.* "Gymnophallus, eine neue Gattung der Vogeldistomen," Centralbl. f. Bakt., etc., 1900, p. 22.

† *Jameson*, *H. L.*, "On the Origin of Pearls," Proc. Zool. Soc., London, 1902, p. 153.

measures 0·05 mm. in diameter. It is much larger than the ventral sucker, which is only 0·033 mm. The latter is situated behind the centre of the body, and its inner margin is distinctly crenulated. The small pharynx follows the oral sucker immediately, and leads into a short œsophagus slightly longer than the pharynx. The intestinal lobes are broad, and extend beyond the centre of the body: these are usually intensely black from food material, with here and there globules of some fatty or oily substance. The excretory vesicle is large, its forks reaching forward in front of the intestinal lobes into the region of the glands, and it opens by a small posterior pore. Behind the vesicle the testes may be seen as two oval masses placed symmetrically one on each side of the body, but no other reproductive organs are apparent. The glands in the head region are a mass of large cells with prominent nuclei. They occupy nearly the whole of the region in front of the intestine, and reach down the sides for more than half the length of the body. They open into ducts which are visible as small apertures round the oral suckers. The presence of these head glands leads one to expect an encysted stage of this Trematode. An encysted *Gymnophallus* has not been found, and Jameson* discovered that his 'Pearl Trematode' did not encyst, but lay resting in a sac made of the epithelial cells of the mantle of its host, the Mussel, this apparently taking the place of an encysted stage. The presence of the other *Gymnophallus* cercariæ in the same position in bivalves (*i.e.*, between the shell and the mantle) suggests that the same state of things exists in these cases, and that they do not, strictly speaking, encyst. The present cercaria is therefore unlike the other species of the genus in its habitat as well as in the presence of these glands, very probably also in having an encysted stage. It does not appear to agree with any known adult form. Its nearest ally (certainly its nearest in size) is probably *Gymnophallus somateriæ* (Levinson), which lives in the intestine of the Eider Duck *Somateria mollissima*. The relative sizes of the

* Op. cit.

suckers are much the same, but the intestine of the present worm is larger and extends further down the body. It differs from the 'Pearl Trematode' described by Jameson and Nicoll* in its smaller size, conspicuous head glands, larger intestine, greater size of the oral sucker in relation to the ventral, and in the shape of the excretory vesicle. The cercaria found by Levinsen† in *Saxicava rugosa*, as well as Jameson's 'Pearl Trematode', is referred by Odhner‡ to *Gymnophallus bursicola*, Odh., which also occurs in the Eider Duck, and agrees with these cercariæ far more closely than does *G. somateriæ*, to which species Jameson originally referred his worm. Nicoll§ however considers that his new species *G. dapsilis* from *Oidemia fusca* and *O. nigra* (Velvet Scoter and Common Scoter) has equally strong claims to be regarded as the adult of the 'Pearl Trematode.' *Cercaria glandosa* occurs in about ten per cent. of the *Paludestrina stagnalis* from Fenham Flats near Holy Island: it is usually found singly, but as many as six specimens have been counted in one animal.

Cercaria macomæ, nov. (Plate I., fig. 2.) This cercaria occurred in several specimens of *Macoma balthica* from Fenham Flats, between the mantle and shell. Two or three specimens were sometimes found in one mollusk. It is oval and measures 0·70 mm. in length when at rest. The body is covered with spines and is very transparent. The oral sucker measures 0·22–0·26 mm. in diameter and the ventral 0·06–0.07 mm. The latter is situated well behind the centre of the body and its inner margin is crenulated. The oral sucker leads to a small pharynx, and this to a short œsophagus branching into two broad intestinal lobes without much food inside, and in

* *Nicoll, W.*, "Notes on Trematode Parasites of the Cockle (Cardium edule) and Mussel (Mytilus edulis)," Ann. and Mag. Nat. Hist., Ser. 7, Vol. XVII., 1906, p. 148.

† *Levinsen, G. M. R.*, "Bidrag til Kundskab om Grononlands Trematodfauna," Overs. K. D. v. Selsk. Forh., 1881, p. 52.

‡ *Odhner, T.*, "Die Trematoden des Arktischen Gebietes," Fauna Arctica, 1905, p. 313.

§ *Nicoll, W.*, "Observations on the Trematode Parasites of British Birds," Ann. and Mag. Nat. Hist., Ser. 7, Vol. XX., 1907, p. 265.

consequence generally colourless. The lobes reach not quite to the level of the centre of the ventral sucker. The excretory vesicle is clear and somewhat horseshoe-shaped. The reproductive organs are in part well developed, a pair of oval testes lying one each side of the excretory vesicle, and reaching to the level of the centre of the ventral sucker. The ovary lies just in front of the right testis: it is also oval and slightly smaller than that organ. The vitellaria lie below and to the side of the ventral sucker. They consist of two roundish masses of very opaque cells, each giving off a short and rather thick duct which runs forward and unites with its fellow just in front of the ventral sucker. I might mention here a peculiar structure noticed in one or two of the specimens immediately in front of the ventral sucker (see fig. 2, X.) It looked like an oval aperture with a rim and muscles radiating from it. It was not to be seen in preserved specimens, and I am at present unable to account for it.

This cercaria does not agree with any known species of *Gymnophallus*; in relative size the suckers differ from those of all the others. It appears to be nearest to Nicoll's *G. dapsilis* mentioned above. The forward position of the vitellaria is rather similar, but the ventral sucker in the present species is smaller in relation to the oral sucker.

This worm was found in three specimens of *Macoma balthica* out of about twenty examined.

Cercaria strigata (Plate I. fig. 3.) This cercaria, previously referred to *Brachycœlium luteum*, is now considered by Giard to be the larval stage of *Gymnophallus somateriæ*, Levins. It occurs very commonly in *Tellina tenuis* and rarely in *Donax vittatus*, both from Alnmouth. These mollusks are often cast up alive on the beach, and most probably are much eaten by the sea-birds which feed there. The Eider Duck, however, is not common there, and if it ever comes is a rare visitor, whereas it is frequent on Fenham Flats.

Having found this worm abundantly since first recording it from Northumberland, I am now able to give a more correct

figure and description of it, and for convenience have given it the name of *Cercaria strigata*. This cercaria occurs between the mantle and shell of *Tellina tenuis* and *Donax vittatus*; its body is oval and very conspicuously striated by rows of spines. Length 0·30–0·40 mm., oral suckers 0.09 mm., ventral sucker 0·05 mm., agreeing fairly well with Giard's measurement (*i.e.*, length 0·42–05 mm., oral sucker 0·098–0·10 mm., ventral sucker 0·052 mm.). The pharynx (0·03 mm. long) leads to a short œsophagus, and this branches into two broad, clear, and almost circular lobes, reaching a very little way below the anterior margin of the ventral sucker. The excretory vesicle is regularly and gracefully curved, somewhat in the shape of a lyre. A pair of testes are occasionally seen symmetrically placed, one on each side behind the ventral sucker. The hind part of the body is slightly drawn out just where the excretory vesicle opens, giving the cercaria the appearance of having a very short tail, and in some examples this is very conspicuous. This is alluded to by Giard*, and Pelseneer† figures and describes evidently the same cercaria, which he considers to be probably the young form of his fork-tailed *Cercaria syndosmyæ*. The latter cercaria has the suckers nearly equal, which makes it unlikely that this is the same worm. When I first found the cercaria in *Tellina*, I believed it should have been tailed, but since then I have regarded this as erroneous, since no tailed forms of the cercariæ of *Gymnophallus* have ever been seen, and the only younger stage known is that described by Jameson, and later found abundantly by Nicoll and myself in the cockle, *Cardium edule*, and in *Tapes decussata*, where the cercariæ occur in simple sporocysts and are tailless. The cercariæ are often to be seen free, having emerged from the sporocysts, and they never have tails. Although *Cercaria syndosmyæ* is in many ways like a *Gymnophallus*, *e.g.* in the digestive system and excretory vesicle, yet I think it is more likely to belong to some other allied genus.

* Op. cit., Comptes rendus des séances de la Société de Biologie, T. LXIII., p. 419, 1907.

† Op. cit., p. 173 and 185, Pl. X., fig. 22.

As to *Cercaria strigata* being the young of *Gymnophallus somateriæ*, it appears to me to differ in many respects, although as Giard points out, it at the same time agrees with it in many ways. For instance the length of the cercaria is almost identical—in my specimens smaller, which of course is usual in the larval stage. The relative size of the suckers is also almost the same. Again, the arrangement of the testes is the same, but this varies little in all the species of the genus. On the other hand, in my specimens the cercaria is broader than *G. somateriæ*, and the striation is much more conspicuous. The excretory vesicle is curved much more elaborately, and is very definite and constant in its shape; and the lobes of the intestine, which are exceedingly broad, reach to below the anterior margin of the ventral sucker. Finally, ducks feed seldom at Alnmouth, and the occurrence of the cercaria so frequently in *Tellina tenuis* would seem to point to a commoner bird for the final host, such as one of the gulls, many of which are constant feeders on the beach. Several gulls are known to harbour species of *Gymnophallus*, *e.g. G. deliciosus* (Olss.) in *Larus argentatus*, *L. fuscus* and *L. canus*.

This cercaria occurred in every specimen of *Tellina tenuis* examined (about twenty), and it was only once found in *Donax vittatus* out of about a dozen examined.

Genus SPELOTREMA, Jägerskiöld.

Cercaria corophii, nov. (Plate I. fig. 4, 5.) This cercaria occurs in large numbers encysted near the surface of the body and legs of the Amphipods *Corophium grossipes* and *Gammarus duebeni*, especially in the former, just beneath the cuticle. It is enclosed in cysts slightly longer than broad, measuring 0·16 × 0·14 mm., and having thick transparent walls. Within the cercaria is curled up, its oral sucker and part of its digestive system usually visible, and sometimes the ventral sucker. When pressed out of the cyst the cercaria is long and rather narrow, the head end being smaller than the posterior; length 0·34 mm., oral sucker 0·03 mm. across, narrow prepharynx 0·04 mm. long, pharynx 0.016 mm. long.

A long and narrow œsophagus runs to about half way down the body, and there branches into two short lobes. Between these lobes and slightly in front of their termination is the small ventral sucker, 0·023 mm. across.

This *Spelotrema* does not appear to fit in with any known species.

Cercaria balani, nov. (Plate I. fig. 6, 7.) This species occurs encysted in the common barnacle, *Balanus balanoides*, which encrusts the rocks and mussels at Budle and Fenham Flats. The cyst is thin-walled and spherical, measuring 0·04 mm. in diameter. In it is curled up a pale yellow cercaria measuring, when extended, about 1 mm. in length. Unfortunately measurements of the organs were not made and the specimens were preserved badly, so that at present they cannot be determined. The size of this species suggests its being the larval stage of *Spelotrema excellens*, Nicoll* which lives in the Herring Gull *Larus argentatus*, and this would be a very likely host for the worm, as the Herring Gull is one of the common feeders on the coast. It, however, differs from *Spelotrema excellens* in the position of the pharynx, which is situated nearer the intestinal lobes than the oral sucker, thus giving great length to the prepharynx. The intestinal lobes extend slightly beyond the ventral sucker. The body is covered with small spines.

Cercaria carcini, nov. (Plate I., fig. 8–9). This cercaria occurred encysted in *Carcinus mœnas*, the common green crab of our coast. When pressed out of the cyst it corresponds in almost every way with the worm from the same crab described by McIntosh†. It is 0·54 mm. long, its smallest breadth being in the centre of the body. The suckers are almost equal. The œsophagus is more than twice the length of the prepharynx, and the intestinal lobes reach to the level of the anterior margin of the ventral sucker. Two round bodies,

* *Nicoll, W.*, Op. cit.. Ann. and Mag. Nat. Hist., Ser. 7, Vol. XX., 1907, p. 248.

† *McIntosh*, "The Trematode Larva and Ascaris of the *Carcinus mœnas*," Journal of Microscopical Science, Vol. V., N.S., 1865, p. 201.

presumably the testes, are faintly visible. The curious thing about this worm is that its cyst is distinctly oval and measures 0·40–0·35 mm., and its walls are very thin, whereas McIntosh's worm came from a spherical cyst with a very thick wall, and measured 0·13 mm. in diameter. This points, I think, to their being different species. Another encysted cercaria was noticed (Plate I., fig. 10) from *Carcinus mænas*, the cyst measuring 0·2 mm. across, and quite spherical. Unfortunately the worm was destroyed in pressing it out of the cyst. The wall of the cyst was thick, and in all probability this was the species described by McIntosh.

In the absence of more detailed measurements it is almost impossible to attempt to fit in these larval forms of *Spelotrema* with any known adults. It is interesting to find that all those so far observed encyst in Crustacea. Villot* found *Distomum brachysomum*, Creplin, which seems to be a species of *Spelotrema*, encysted in *Anthura gracilis*.

Two cases of the younger stages of what are almost certainly species of this genus have been observed in Mollusca; in both cases the cercariæ, which are without tails, occurred in simple round sporocysts. One of these, *Cercaria crispata*, was found by Pelseneer† in *Natica alderi* at Boulogne-sur-Mer; the second was found by myself‡ in *Littorina rudis*. In the latter case many more cercariæ were found in the sporocysts, only two or three occurring in Pelseneer's species. Nicoll§ considers that those from *Littorina rudis* are likely to be an early stage of *Spelotrema claviforme* (Brandes) from *Tringa alpina* and *Aegialites hiaticula* (Dunlin and Ringed Plover), which is a very small species not exceeding 0·40 mm. in length.

Thus so far as we know the genus *Spelotrema* lives in the adult stage in marine birds, the cercaria encysts in Crustacea, and is developed without a tail in sporocysts in a mollusk (in

* Op. cit.

† Op. cit., p. 171, Pl. XI., fig. 39-40.

‡ "Notes on Northumbrian Trematodes," op. cit., p. 6.

§ *Nicoll*, W., Op. cit., Ann. and Mag. Nat. Hist., 1907, p. 255.

the two cases known, a Gastropod), the redia stage being omitted.

A word may be said here about the closely allied genus *Maritrema* of Nicoll*. This author suggests that the two cercariæ *C. oocysta* and *C. pirum* discovered by me† encysted in *Paludestrina stagnalis* are larval stages of Trematodes belonging to this genus, and it appears extremely likely that this is the case. *C. oocysta* was found encysted in sporocysts, and *C. pirum* had in all probability also encysted in the sporocysts in which they were developed, although these were not actually seen. The cysts were so packed together that it is unlikely that they came from another host. Tailed forms of *C. oocysta* were also found within the sporocysts, which shows this cercaria to differ from the genus *Spelotrema* in this respect as well as in others. As the sporocysts of *C. pirum* were not found, it was impossible to ascertain whether the cercariæ were tailed or not. It seems rather a curious fact that cercariæ which have no free-swimming stage in their life history, and encyst in the sporocysts, should possess tails, for they can have no use for them. A similar case was observed by me in a Trematode from *Cardium edule*, tailed cercariæ being found in the sporocysts side by side with the encysted forms‡.

A comparison of the scantily known life history of the three genera *Gymnophallus*, *Spelotrema*, and *Maritrema* is here given in tabulated form :—

Genus	*Adult.*	*Encysted stage*	*Cercaria*	*Redia*	*Sporocyst*
Gymnophallus	marine birds	omitted, but a resting stage occurs in Mollusca	no tail (?); developed in sporocysts	omitted	in Mollusca
Spelotrema	,,	in Crustacea	no tail; developed in sporocysts	,,	,,
Maritrema	,,	in sporocysts	tailed; developed in sporocysts	,,	,,

* *Nicoll, W.*, Op. cit., Ann. and Mag. Nat. Hist., 1907, p. 265.

† Op. cit., Trans. Nat. Hist. Soc. Northbd., etc., N.S., Vol. I., p. 445–446.

‡ "On Three Mollusk-infesting Trematodes," Ann. and Mag. Nat. Hist., 1907.

Here I may record another larval Trematode from the small bivalve *Scrobicularia tenuis* from Fenham Flats. This mollusk was found by Villot to harbour several larval Trematodes. One of these (viz., *Echinostomum leptosomum*) has already been described* in a former paper. I am now able to record another of Villot's species, namely, *Cercaria fissicauda*, which as Pelseneer points out† should be named *Cercaria dichotoma*, Müller. The sporocysts occurred in the liver, which was full of them; and in the same specimens the encysted cercariæ of *Echinostomum leptosomum* were found in the foot. Pelseneer found his specimens of *C. dichotoma* in *Tellina solidula* (= *Macoma balthica*).

Cercaria dichotoma, Müller (Plate II. fig. 1, 2) occurs in long knobbed sporocysts, very transparent and structureless, in which many cercariæ are crowded together. The cercaria is about 0·20 mm. long, including the tail, which is slightly shorter than the body, and forked. Anterior sucker 0·033 mm. across, leading directly into a pharynx. Although Villot did not see this pharynx, and described and figured the worm as having none, yet it was seen by later observers and is very distinct, measuring 0·016 mm. in length. There is a long œsophagus branching beyond the centre of the body into two short lobes. The ventral sucker lies well behind the centre of the body and measures 0·029 mm. in diameter. An elaborately curved horseshoe-shaped (or perhaps more strictly lyre-shaped) excretory vesicle occupies most of the posterior part of the body, and is continued along the tail and into each fork of it. The granules contained in the vesicle are the most conspicuous features of the cercariæ within the sporocysts.

At present nothing seems to be known about further stages of this Trematode, and it is difficult to suggest to what genus it may belong. I only found it once in about 50 specimens examined. This cercaria was met with by Mr. Andrew Scott

* Op. cit., Trans. Nat. Hist. Soc. Northbd., etc., p. 447.

† *Pelseneer, P.*, Op. cit., p 173.

in *Cardium edule* on the Lancashire coast*, and by Huet† in the same mollusk in Normandy.

Encysted Trematodes are not uncommon in fish. One frequently found off our coast is from the Dab *Pleuronectes limanda*. This worm is described by Johnstone‡ from the West coast of England, and he refers it to *Distomum valde-inflatum*, Stossich. I have found what seems to be the same species in our local Dabs, especially in the younger specimens, as Johnstone describes. They occur beneath the skin of the under side, and also now and then on the gills. I have also found it, but not so frequently, in the Long Rough Dab *Hippoglossus limandoides*, Lemon Dab *Pleuronectes microcephalus* and Witch *P. cynoglossus*. My specimens (length when pressed out of cyst 2·9–3 mm.) are larger than Johnstone's (about 1·25 mm.), but his are not so far developed as mine. It is possible that they represent different species, but it is more probable that they are the same, for my specimens agree very well with his description so far as it goes; but few measurements are given, and the number of head spines is not stated.

The worm (Plate II., fig. 3, 4, 5, 6) is enclosed in a double sac, the first very thick and tough, and the second transparent and showing the coiled-up worm through its walls. When pressed out of the cyst the worm is seen to have the shape of a very elongated pear, with its body covered with strong spines gradually disappearing towards the posterior end. At the head end they are very conspicuous, and round the anterior sucker there are two rows of very distinct spines. The body spines are slightly curved, but those round the head are straight (see fig. 4) and taper to a point distally. Those of the upper row are shorter than those in the lower (upper spines 0·022 mm. long, lower spines 0·026 mm. long.) The number

* *Johnstone, J.*, "Internal Parasites and Diseased Conditions of Fishes," Lancashire Fisheries Report for 1904, p. 107, Pl. V.

† *Huet*, "Note sur le *Bucephalus haimeanus*," Bull. Soc. Linn. Normandie, sér. 4, T I.I., fig. 3–4.

‡ *Johnstone, J.*, Op. cit., p. 98.

of head spines is variable. I have examined many specimens and find these head spines vary from 48 to 58 in two uninterrupted rows of 24 to 29 spines each. Johnstone's figure of the head shows the lower spines also longer than the upper, but he does not mention the fact. The oral sucker measures 0·26 mm. across, and has a large aperture leading to a long prepharynx about 0·5 mm. long. The pharynx (0·18 mm. long) is thick, and leads to a broad œsophagus branching into two rather thin intestinal lobes which reach almost to the end of the body. Just below the fork of the intestine is the genital aperture, which occurs immediately in front (either median or to the side) of the ventral sucker (0·23–0·26 mm. across). Two small round testes and an ovary lie in a row obliquely across the hinder portion of the body between the ventral sucker and the posterior end, but their positions are somewhat variable, and sometimes they are placed almost straight behind each other. The vasa deferentia are distinctly seen running to a thin, somewhat club-shaped vesicula seminalis, in front of which the cirrus-sac encloses a small spined cirrus. The ovary has a thin duct running from it to the genital opening, but none of the other female organs are yet developed. A large opaque excretory vesicle occupies the posterior region, hiding the testes and ovary, but by gentle pressure the contents of the vesicle are set free, and these organs can be clearly seen.

I do not think this worm is *Distomum valdeinflatum*, Stossich, which, according to Monticelli*, is synonymous with *D. bicoronatum*, Stossich, and *Echinostomum cesticillus*, Molin. *E. cesticillus* is now placed in the genus *Stephanochasmus*, Loos†, and this author recognises both *S. cesticillus* and *S. bicoronatum* as separate species. The former has 35–36 head spines, and the latter 31, the lower row of both species having one spine less than the upper, thus forming a gap in the centre; and the spines of the lower row are shorter than those of the upper, which is exactly the reverse in my specimens.

* *Monticelli*, "Studii sui Trematodi endoparassiti," Zool. Jahrb. Supp. III., 1893, p. 161.

† *Loos, A.*, "Ueber die Fasciolidengenera Stephanochasmus, etc.," Centralbl. f. Bakt., etc., Bd. XXIX., 1901, p. 595.

A far more likely adult seems to be *Stephanochasmus baccatus*, Nicoll*, from the Halibut *Hippoglossus vulgaris*, Flem. This worm has 56 head spines, the lower row being longer than the upper and uninterrupted. The prepharynx is very short, but this is probably due to the action of the preserving medium, and this may also account for the shortness of the body. The reproductive organs, not being fully developed in the larval form, cannot very well be compared with those of Nicoll's specimen. The above characteristics of the head warrant, I think, this worm being provisionally looked upon as the larval form of *Stephanochasmus baccatus*. The variation in the head spines is interesting, especially as Monticelli† thought those of his larval forms from *Box salpa* and *Rhombus lævis* were also variable. On the other hand Loos‡, in all the adults described, finds the number of head spines generally constant for each species.

Derogenes varicus (O. F. Müll.) occurs in many of the local fish, and is perhaps the commonest Trematode from our coast. The host in which I have found it in greatest numbers is the Long Rough Dab, chiefly in the mouth and on the gills, but sometimes in the œsophagus, stomach, and intestine. Odhner§ considers that its presence in the gills is perhaps due to the wandering of the parasite after the death of the host, the true habitat being the stomach. I believe, however, the mouth and gills of the Long Rough Dab to be quite as much the true habitat for the worm as the stomach.

On a specimen of *Derogenes varicus* taken from the mouth of the above-mentioned fish in June, 1907, I found clinging to it a parasitic Copepod (Plate III., fig. 2–3). The Copepod was alive and clung firmly to the worm by two very large hooks at the head end. Now a parasitic Copepod is not likely to inhabit any part of the intestine of a fish, and I

* *Nicoll*, W., "A Contribution towards a Knowledge of the Entozoa of British Marine Fishes," Ann. and Mag. Nat. Hist., Ser. 7, Vol. XIX., 1907, p. 80.

† Op. cit., p. 161.

‡ *Loos*, A., Op. cit.

§ *Odhner*, T., Fauna Arctica, p. 360.

regard this as strong evidence that the mouth is a natural habitat for *Derogenes varicus*.

An ectoparasitic Trematode is known that lives attached to a Copepod parasitic on a fish, *i.e.*, *Udonella caligorum*, Johnson, which lives on the ovisacs and posterior part of *Caligus curtus* on the Cod and other Gadoids*; but this is, so far as I know, the first time that a Copepod has been found parasitic on a Trematode. Unfortunately the specimen is greatly spoiled by the preserving agent, and only very rough sketches were made of the living animal. It appears to be a new species, possibly a new genus, probably nearly allied to *Ergasilus*†, as Mr. T. Scott kindly suggested to me from a sketch submitted to him. The hooks on the head (the antennæ) are much thicker and heavier in my specimen. Only one egg-bag was to be seen, and it was full of well developed eggs of a purplish hue. I give a drawing of *Derogenes varicus* (fig. 1) to compare with figures 2 and 3. It is to be hoped that further specimens may be found to establish this new species (or genus) on a firm foundation. So far much search has produced no more specimens.

Steringophorus ovacutus, n. sp. (Plate III., figs. 4–5).—I shall conclude with a description (unfortunately not quite complete) of a new species of Trematode belonging to the genus *Steringophorus*, Odhner. Only one species of this genus is, I believe, known, and I am pleased to be able to add a second, which I have named *Steringophorus ovacutus*. This Trematode is rare. It was found in the intestine of the Long Rough Dab *Hippoglossus limandoides* (June and November, 1907); only four specimens were found, and each time they occurred singly. It closely resembles *S. furciger* (Olss.) When alive it is bright red, and often appears pear-shaped owing to the head end being stretched out. The colour vanishes immediately after death, which takes place almost directly the worm is taken from the intestine; it then has a pale yellow

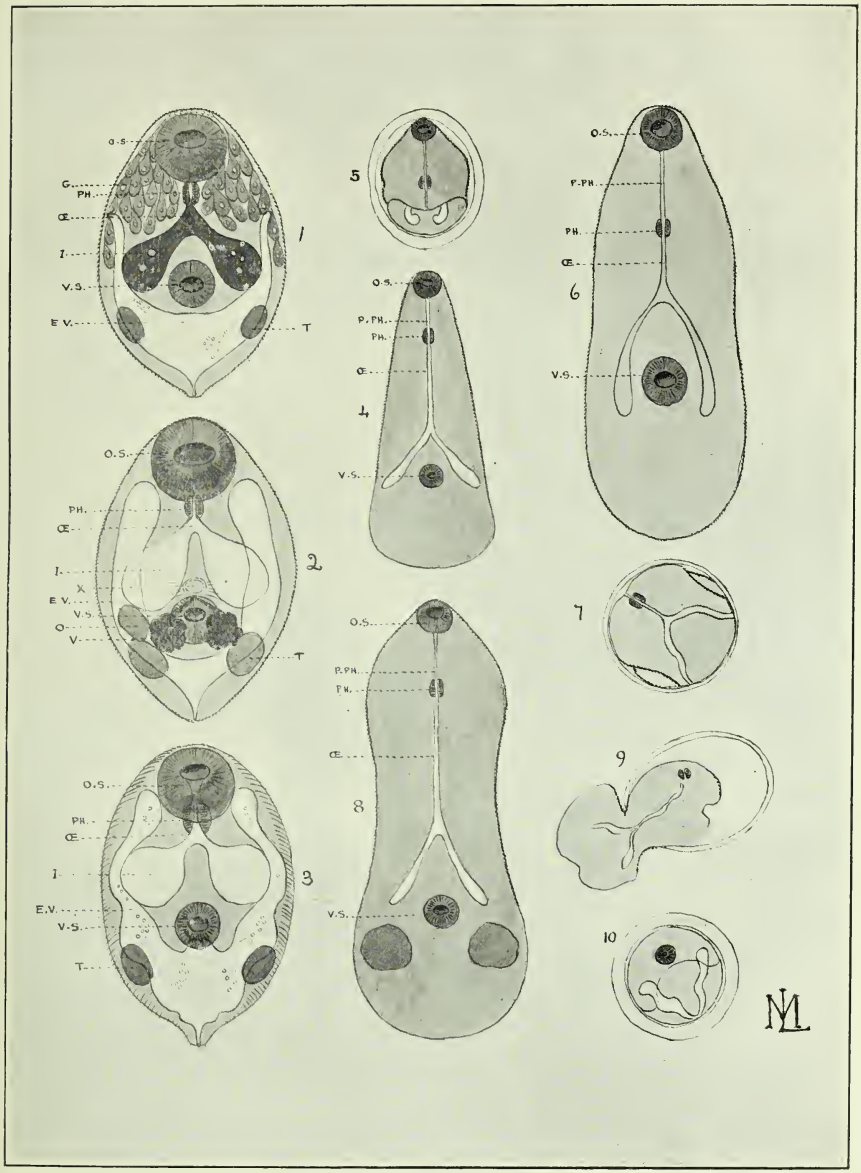
* *Scott, T.*, 19th Annual Report of the Fisheries Board for Scotland, 1901, p. 144.

† *Scott, T.*, Op. cit., p. 122.

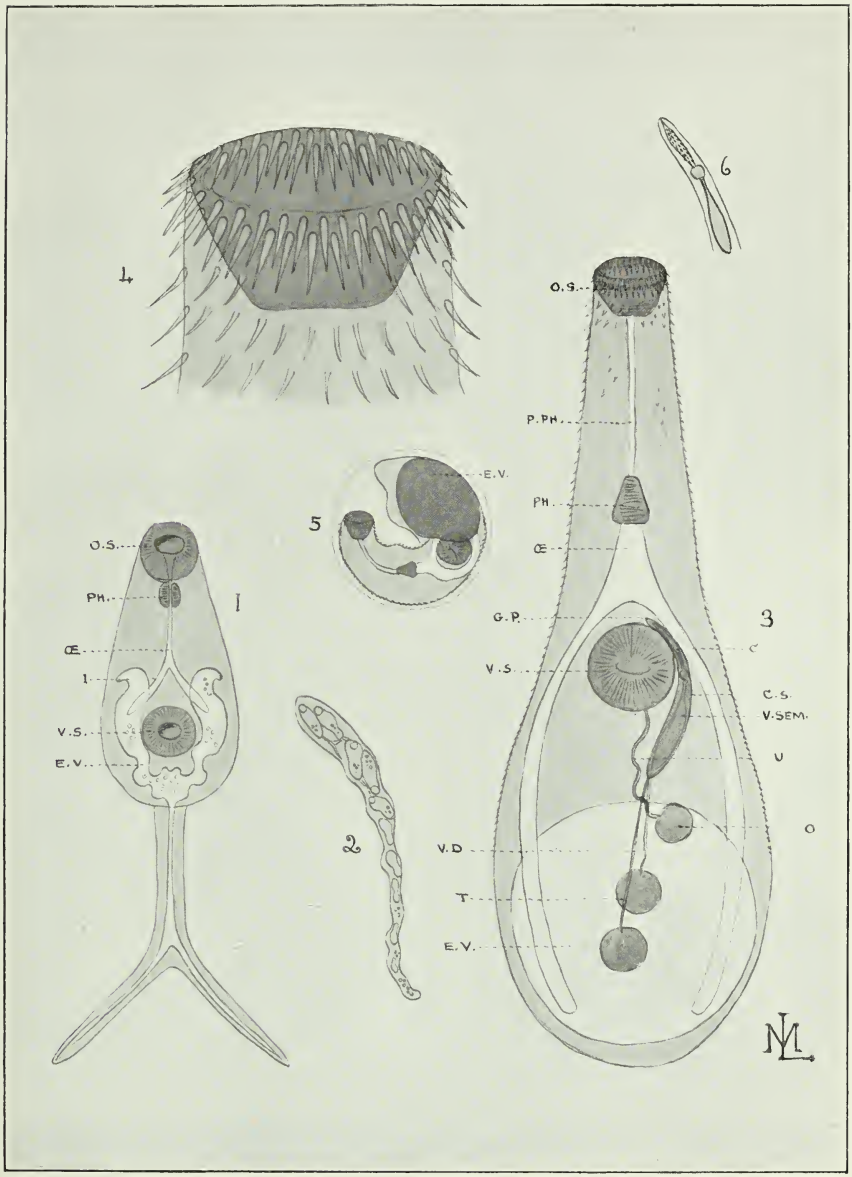
colour with a patch of bright greenish brown (the eggs) at the posterior part of the body. The cuticle is unarmed. When dead and pressed under a cover slip the worm measures 1·80–2·30 mm. in length, but may be much longer than this when alive. The maximum breadth, about 1·16–1·33 mm., is in the region of the ventral sucker. The shape is a broad oval with the ends more rounded than in *S. furciger*. The ventral sucker is almost exactly in the centre, and behind this the hind end of the body is taken up by the eggs, the uterus winding in many twists and masking most of the other organs. Like *S. furciger* the body has a round section in the anterior part, but flattens in the region of the ventral sucker. Both suckers are circular, the oral measuring 0·32–0·40 mm. across and the ventral 0·60–0·80 mm., their relative sizes being about 1 : 2. The oral sucker opens externally in a large mouth that leads to a very short prepharynx, and this to a muscular pharynx. There is a short and narrow œsophagus, branching very soon into the thin intestinal lobes reaching, as in *S. furciger*, to beyond the testes for about the same length as these organs. The excretory bladder is not so conspicuous as in *S. furciger*, because in all the specimens it is clear instead of full of dark matter. It is forked in much the same way as in *S. furciger*, the single stem lying dorsally and the lobes (which are swollen in front) coming forward ventrally; the latter reach to beyond the posterior level of the oral sucker when the worm is at rest. The hinder part of the excretory and digestive system is usually completely hidden, in pressed examples, by the eggs and vitellaria. The genital pore occurs close to the pharynx, to the left side above the fork of the intestine, the male and female ducts opening into a genital sinus, the male on the right and the female on the left. The form of the sinus and the openings closely resemble those of *S. furciger*. The testes are oval bodies, lying dorsal to and just behind the ventral sucker, and ventral to the intestinal lobes. They are oval and measure 0·12 mm. in length. The vasa deferentia are very thin, and run forwards from the testes to the vesicula seminalis, which is divided into two almost

equal parts, and is enclosed in the cirrus sac. The latter measures 0·30 mm. in length, and is placed somewhat obliquely, the dorsal part being to the right and the ventral to the left; it contains, in addition to the vesicula seminalis and in front of it, a large pars prostatica, the glands of which fill the sac. The cirrus was not seen. The ovary and parts connected with it have not yet been clearly made out, but the former probably occurs much in the same position as in *S. furciger*, as the ducts from the vitellaria join in a small triangular reservoir in much the same position as in that species. The uterus is very long and winding, much longer than in *S. furciger*, and finally runs up in a straight duct to open into the gential sinus. The eggs are a bright brown with a distinct green shade, and are pointed at one end and round at the other; they measure 0·046 × 0·026 mm. It is from the shape of the eggs that the species is named *ovacutus*. The vitellaria occur far forward, beginning anterior to the centre of the ventral sucker and reaching to the level of the fork of the intestine. They are arborescent, and three main ducts run from each of them, which soon unite into one on each side; and finally these join together in the reservoir mentioned above.

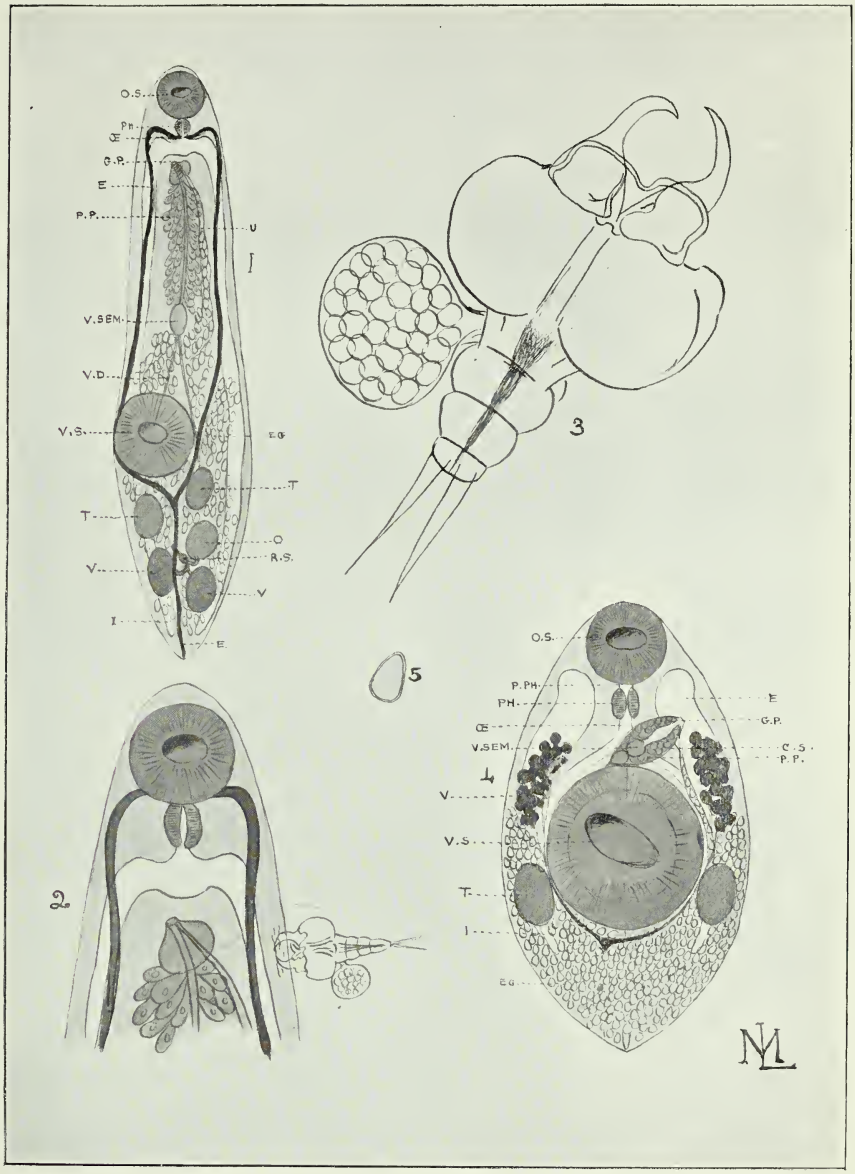
It is hoped to describe the female organs in more detail hereafter. Meanwhile, the above characters make it, I think, certain that we are here dealing with a distinct species of *Steringophorus*.



Trematodes of the Northumberland Coast.



Trematodes of the Northumberland Coast.



Trematodes of the Northumberland Coast.

EXPLANATION OF PLATES

The following letters apply to all the figures :—

O. S.	oral sucker	U.	uterus
O.	head glands	R. S.	receptaculum seminis
PH.	pharynx	T.	testes
P. PH.	prepharynx	V. D.	vas deferens
Œ	œsophagus	G. P.	genital pore
I.	intestine	P. P.	pars prostatica
V. S.	ventral sucker	C.	cirrus
E. V.	excretory vesicle	C. S.	cirrus sac
E.	excretory system	V. SEM.	vesicula seminalis
O.	ovary	EG.	eggs

Plate I.

Fig. 1. *Cercaria glandosa* (length 0·20 mm.) from *Paludestrina stagnalis.*
Fig. 2. *Cercaria macomæ* (length 0·70 mm) from *Macoma balthica.*
Fig. 3. *Cercaria strigata* (length 0·40 mm.) from *Tellina tenuis.*
Fig. 4. *Cercaria corophii* (length 0·34 mm.) from *Corophium grossipes.*
Fig. 5. ,, ,, (0·16 × 0·14 mm.) encysted.
Fig. 6. *Cercaria balani* (length about 1 mm.) from *Balanus balanoides.*
Fig. 7. ,, ,, (0·04 mm.) encysted.
Fig. 8. *Cercaria carcini* (length 0·54 mm.) from *Carcinus mœnas.*
Fig. 9. ,, ,, (cyst 0·40 × 0·35 mm.) escaping from cyst.
Fig. 10. Cercaria encysted in *Carcinus mœnas* (0·13 mm.)

Plate II.

Fig. 1. *Cercaria dichotoma,* Müller (length 0·20 mm.) from *Scrobicularia tenuis.*
Fig. 2. Sporocyst of *Cercaria dichotoma.*
Fig. 3. *Stephanochasmus baccatus,* Nicoll (?), pressed out of cyst (length 2·9 mm.) from Dab.
Fig. 4. ,, ,, (encysted)
Fig. 5. ,, ,, head
Fig. 6. ,, ,, cirrus sac

Plate III.

Fig. 1. *Derogenes varicus* (O. F. Müll.), (length 3 mm.) from Long Rough Dab.
Fig. 2. ,, ,, with parasitic Copepod.
Fig. 3. Parasitic Copepod.
Fig. 4. *Steringophorus ovacutus,* n.sp. (length 2·3 mm.) from Long Rough Dab.
Fig. 5. Egg of *S. ovacutus.*

Preliminary Note on a Case of Thrust and Crush-brecciation in the Magnesian Limestone, Co. Durham. By David Woolacott, D.Sc., F.G.S., Armstrong College, Newcastle-upon-Tyne.

Along the coast from South Shields to Marsden the Lower, Middle and Upper Magnesian Limestone are exposed. Although the beds have been much disturbed, yet on passing southwards from the Trow Rocks to the south end of Marsden Bay, these three divisions of the Permian can be followed in regular sequence, with a general low dip of a few degrees to the south. The Lower division is a brownish-yellow, regularly-bedded rock, the base of which is not seen, but some 30 feet are exposed. At the Trow Rocks and in Frenchman's Bay its lower beds are not disturbed, but the top layers are considerably so, being fractured, brecciated, tilted-up and laterally displaced. Resting on this irregular base is a mass of white brecciated limestone reaching a thickness of some 50 feet. The pieces forming this bed vary in size from the smallest dimensions to blocks several feet across, and are generally firmly cemented together. Sometimes the fragments have been dissolved out, and the rock has become cellular in consequence. In some places the original major bedding-planes can be observed, while in other parts the thin laminations are traceable. The junction with the Lower Limestone is a thrust-plane, which, however, does not always exactly coincide with the line separating the two beds, but is seldom more than a few feet from it. The direction of the thrust has here obviously been from the north—the brecciation of the Brecciated Limestone as well as the disturbance of the upper layers of the Lower Limestone being due to it.

The Brecciated Beds can be followed along the coast from the Trow Rocks to the north end of Marsden Bay. The top, which is seen at the latter place, is very irregular and hummocky. Above it occurs a soft, powdery, yellow

limestone about 40 feet in thickness. This rock is much fissured and disturbed. The fissures are vertical, and many are of considerable width, reaching as much as 40 feet across. They are filled with fragments from the beds immediately above, and in one case the fissure must have been opened twice, as there is evidence of two distinct infillings. Some of these fissures can be seen to pass into the top of the Brecciated Limestone, but presumably they do not penetrate far into it. In this zone the chief breccia gashes are also found. These are triangular in section, tapering downwards, and are filled with fragments, generally firmly cemented together, of a hard, minutely-concretionary bed, that follows immediately above the soft yellow beds. This layer is wedge-shaped, thinning out gradually to the south. It is followed by about 80 feet of regularly-bedded limestone, which is but little disturbed, except for one or two fissures that occur in it. The material filling one of these is specially interesting, as it shows a gradual increase in brecciation from top to bottom. At the top of this group is the flexible limestone, which becomes of great importance as an aid in tracing out the beds in the folded and fractured area that follows. In the cliff just south of the stack known as Lot's Wife a fault, which has been widened by erosion and filled with breccia, occurs. It has a throw of about 30 feet to the south, and shifts the flexible limestone from near the top to the base of the section, thus bringing in higher strata of the Middle Permian.

From this point southwards past the "Grotto" the beds are of a very irregular nature, there being an intermixture of hard, white, crystalline with soft, yellow beds. Their total thickness is difficult to estimate, partly owing to the thickening and dying out of certain beds, but also much more because of the folding and thrusting that has taken place. It however probably reaches about 120 feet. The main hard, white, crystalline bed, which is about 50 feet thick at its maximum, is a lens-shaped mass, which thins out very irregularly on the north side into long tapering beds, but on the south dies out gradually, finally ending a little to the south of the "Chimney."

The beds in this part of the section are much folded, brecciated and disturbed. The hard white layers are brecciated in places, while still maintaining their original bedding planes in others. This brecciation coincides with sharp folds and with thrust planes. At one part of the section the soft strata have been squeezed out entirely, and the hard beds have been thrust along an oblique plane against a mass which has acted as a Horst, crush brecciation having been developed on a large scale. The effect of the thrust, as far as this particular horizon is concerned, gradually dies out from this point, and is soon no longer clearly observable. Vertical fissures filled with breccia are also seen here. One of these, in the cliff a little to the south of the "Chimney," is filled with blocks from the Upper Permian, some of the pieces having a volume of nearly 100 cubic feet. The Upper Magnesian Limestone, which is distinctly marked off from the beds below by its peculiar cannon-ball and other concretionary structures, here comes in at the top of the cliff, and having a steady dip to the south it soon occupies the whole of the coast exposure.

In this section, which is two miles long, there is evidence of thrusting, and of brecciation both on a large and small scale produced by thrust-movement; the folding and fissuring of the strata being also probably associated with the same phenomena. The main direction of thrust has clearly been from the north, the amount of lateral displacement and folding having been considerable. The breccia forming the Brecciated Limestone is *in situ*, while that filling the fissures, breccia-gashes and faults, is clearly not so. A detailed and fully illustrated paper dealing with the phenomena discussed in this preliminary note is in preparation.

On some Rare Arachnids captured during 1907.

By A. Randell Jackson, M.B., M.Sc.

(Plate IV.)

During the extremely unpropitious season of 1907 I have had small time for, or opportunity of, doing outdoor work. Some of my correspondents, however, have been more active, and by their assistance a good many interesting species have been got together. Three of these are new to the British fauna. The first is *Maro Falconerii* sp. nov. This is a most minute spider, and has been found by Mr. W. Falconer and myself in Cheshire and Yorkshire. The second, *Ischnothyreus velox* sp. nov., was discovered by Mr. R. S. Bagnall in a hothouse at Alnwick. Subsequently I found it in a similar situation in Chester, and Mr. Bagnall rediscovered it in one of the hothouses at the Botanical Gardens, Kew. It is almost certainly not indigenous, but seems to be establishing itself in suitable situations throughout the country. Its small size and extreme rapidity of foot favour its survival, but have probably delayed for some time its detection and capture. The third species, *Bianor ænescens* (E. Sim.), has been found by Mr. W. H. Bennett in Surrey. It is an Attid or leaping spider, and has occurred in several European countries. No doubt it is a genuine member of our fauna.

After these three novelties, three other species claim the chief interest. In each of these, *one* sex was previously known in Britain, and the other is now recorded for the first time as a native. The first of these is *Maro minutus* (Camb.). Mr. Falconer had discovered the female at Huddersfield in 1905. This year he found both sexes in the same locality, the male being new to science. The second species is *Gongylidiellum paganum* (Sim.) Both sexes of this interesting spider were sent to me by Mr. D. R. Pack-Beresford, by whom they were found near Bagenalstown in Ireland. The male had previously been found near Huddersfield by Mr. Falconer, and the Irish females were identical with one sent to me by that gentleman

several years ago, and which at that time I believed to be the genuine female of *G. paganum*. This belief is now confirmed, and I here figure the female of this small and interesting species, which sex is new to Britain. The remaining spider is *Epiblemium affinitatum* (Camb.) This was obtained in Surrey by Mr. W. H. Bennett, and he succeeded in finding both sexes. One example of the male had previously occurred in Dorset in 1860, whilst the female is new to Britain, and is possibly hitherto undescribed.

Thus I am here recording three species entirely new to Britain of which two are new to science. Also three further species of which one sex is new to our fauna, and at least in one case, to science.

Further, I here figure the female of *Cnephalocotes pusillus* (Menge) which, in Britain at all events, has been up to now confused with that of another species.

Various other rare and local forms are referred to in their appropriate places.

Since this paper has been in the press I have received examples of a Tartarid new to science. Several specimens of this were found in a hot conservatory at Kew and sent to me by Mr. R. S. Bagnall. It undoubtedly belongs to the genus *Trithyreus* (Kraep.), and I have called the species, which is a very distinct one, *T. Bagnallii*. It was too late to get any figures of this interesting Arachnid into the present paper, so I content myself now with a short preliminary description which will be found in an appendix at the end. I hope soon to publish some figures as well as some more remarks on this animal.

I must take this opportunity of thanking those of my correspondents who have collected so many of the forms here recorded. These gentlemen are Messrs. Falconer, Bagnall, Bennett, Britten, Varty-Smith, Pack-Beresford, and F. J. Cole. Mr. Wallis Kew has examined several of the Pseudoscorpions, and the Rev. J. E. Hull has looked up various references for me. Finally, four well known arachnologists have examined

and reported on my new species. My thanks therefore are due to the Rev. O. Pickard-Cambridge, M. E. Simon, Prof. W. Kulczynski, and Prof. H. J. Hansen.

Ischnothyreus velox sp. nov. (Family Oonopidæ.)

Plate IV., figs. 9, 10, 11, 12, and 13.

Length nearly 2 mm. Facies somewhat resembling that of *Oonops pulcher* (Templ.) The male is rather slenderer than the female, but is not much shorter.

Cephalothorax is of a rather dark yellowish-brown, much darker than the abdomen or legs. The depth of colour, however, varies in different individuals.

In the *female* the profile begins to rise immediately behind the eyes and ascends in an inclined plane to the thoracic juncture. It then descends rapidly in a somewhat hollow form to the pedicle.

In the *male* the profile rises suddenly behind the eyes in a strongly gibbous form, the highest point of which is at least as high as the thoracic juncture. Between the eyes and the latter point the outline forms a distinct arc. At the thoracic juncture it descends as in the female sex. In both sexes striæ radiating from the thoracic juncture mark the position of the sutured cephalothoracic segments. On each side of the anterior part of the cephalothorax, about the level of the occiput, a somewhat pyriform space is mapped out by a faint line. The pointed end of this space terminates on each side at the margin of the cephalothorax, near the coxa of the first pair of legs. The whole surface of the cephalothorax is somewhat granular.

The eyes are six in number. All are large and placed upon black spots. The four posteriors are arranged very nearly in a straight line. The two anteriors, obliquely placed, are contiguous on the one hand with the posterior laterals, and on the other each touches its fellow. The enclosed space is deeply pigmented, and the whole ocular area is strongly hirsute.

The CLYPEUS is extremely narrow. It is in fact narrower than each anterior eye.

The FALCES are rather weak, the proximal joint is somewhat conical, being much narrower at the apex than at the base. The distal joint is long and slender.

The STERNUM is broadly heart-shaped, of a clear yellow-brown colour, and besprinkled with long hairs. It is not, or only very slightly, provided with bays corresponding to the coxæ of the walking legs.

The LABIUM is of the same colour. It is short and almost square, with its anterior border rather concave.

The MAXILLÆ differ very much in the two sexes. In the *female* each is of the same colour as the sternum and labium. Each is strongly inclined to the lip, with an almost squarely-cut anterior border, and with a broad, rounded-off, antero-internal angle. In the *male*, however, this angle is drawn out into a fine point, and the anterior border presents in addition a rounded tuberculiform process. The internal border is thickened and of a dark colour. Owing to this tapering of the antero-internal angle the rostrum is distinctly visible rising above the labium.

In connexion with the latter organ, I was quite unable to see any lateral processes springing from it and separating the maxillæ from the sternum as described by M. Simon* in an allied species.

The PALPI of the female are simple; the tarsus is longer than the tibia and patella together. It is acuminate, very hairy, and bears no terminal claw. The palpi of the male are very curious. They are dark brown, nearly black, in colour, and are carried bent outwards in a very remarkable manner as shewn in figure 13. The femur, tibia, and patella are short, broad, and almost similar. There is a little variation in different individuals, but in figure 13 the femur and patella are probably shown a trifle too long. The tarsus is slightly

* Histoire Naturelle des Araignées, vol. i., p. 291.

larger, but only embraces the base of the palpal organs. These are somewhat pear-shaped, and terminate in a stalk bearing one or two minute spine-like apophyses.

The legs are of a clear yellow-brown colour. The order of lengths is 4, 1, 2, 3, but there is not much difference between 1 and 2.

The COXÆ do not fit into hollows in the sternum, but are separated from that structure by a pale chitinous area which extends between contiguous coxæ, and also separates the sternum from the maxillæ, and those organs from the labium. All the coxæ bear a ridge below near the apex.

The TROCHANTERS are all small.

The FEMORA are strong, hairy, and somewhat acuminate; those of the first pair bear two strong spines on the inner border near the apex. This is an important specific character.

The PATELLÆ are short, and similar one to another.

The TIBIÆ are cylindrical. In the first and second legs each bears below two parallel rows of four long spines. These are very strong, and each lies in the direction of the long axis of the leg. These are not present on the third and fourth legs.

Similarly the METATARSI of the two posterior pairs are unarmed, whilst those of the first two pairs bear beneath two parallel rows of spines. These are similar to, but smaller than those of the tibiæ, but each row contains only two spines.

The TARSI are rather short. In the case of the third pair they are about half as long as the metatarsi, but in the others they are even less than this. Near the apex of each there is a deep constriction separating off a terminal subjoint. This is small, is covered with hairs, many of which possess lateral barbs, and terminates in two toothed claws. This description of the legs is taken from female specimens.

The ABDOMEN is of a greyish yellow-brown or clay colour, and is covered with long hairs. It is provided above with a dark brown, shining, horny scutum. This is of a somewhat

oval shape, but the sides are almost parallel. It extends from the anterior end to about the middle of the dorsal surface, but as it is rather narrow it does not occupy the whole breadth of the abdomen. It is nearly squarely truncated behind in the female, in which sex it is rather less in length than in the male. In the latter sex the posterior border is slightly more rounded. It is always covered sparsely with hairs similar to those borne by the surrounding abdominal integument. This structure is known as the *dorsal scutum*. On the ventral surface there are two scuta, but these are much more of the colour of the surrounding integument, and being obscured by hairs, are in some specimens rather difficult to see. They are of a pale yellowish brown colour, and do not contrast sharply with the clay-coloured ventral surface. The arrangement of these two scuta is quite different in the two sexes.

In the *female*, the first or *epigastric* scutum covers the epigastric region, and extends laterally over the pulmonary sacs to completely embrace the pedicle. It terminates behind in a slightly concave border which forms the anterior boundary of the long transverse *rima genitalis* or sexual aperture. On each side of its lower border it bears a spiracle, which looks downwards, slightly backwards and outwards, and which opens into a pulmonary sac. The rima is bounded behind by the *ventral scutum*. This is short and semicircular. The anterior border is nearly straight, and bounds behind the rima genitalis. The posterior border is convex, and is continuous with the chitinous lips of each posterior spiracle. The scutum is divided into two parts by a prominent, boat-shaped, downwardly directed process. On each side this is continued into a ridge running transversely outward. At a point about two-thirds of the distance between the centre of the scutum and its lateral border each ridge terminates in a minute pore-like aperture. With a one inch objective these appear as black dots. On a specimen eviscerated, treated with liquor potassæ, and examined in glycerine, each was seen to be the aperture of a tube-like organ seated under the chitin of the scutum. These apertures possess prominent chitinous

lips which are continuous with the aforesaid ridges. The tubes into which they lead are slightly curved, unbranched, and tapering. They are rather long, reaching to the posterior border of the scutum, to the back of which they are closely applied. Examined with a Leitz 7 lens they appear opaque, and certainly show no signs of irregular, annular, or spiral thickenings. I can form little or no idea as to their functions. They may perhaps be glands secondarily connected with the sexual apparatus. I have never seen descriptions of them. In the centre of the boat-shaped process there is a curious pigmented, convoluted, beaded band. This rises at the apex of the process, runs straight forward to its base, and then becomes curiously twisted. Its convolutions are extremely different in pattern and extent in different individuals, but it was present in all my examples, and always extended on to the anterior part of the scutum, generally reaching nearly to the rima genitalis. It gives the impression of an adherent secretion squeezed out of some tubular gland seated in or below the process itself. I could however see no trace of such an organ, and it does not seem to be detachable. It has no connexion with the two lateral pores, and certainly does not exist in the male. The posterior spiracles are placed laterally at the posterior border of the scutum, which consists of a curved chitinous band convex behind. This border appears to be neither raised above, nor depressed below, the level of the surrounding structures. These spiracles are as wide apart as are their anterior fellows. They are as independent as the similar apertures in the Dysderidæ, and by no means open into any single, median, common vestibule. Each spiracle is rather elongated transversely, and possesses chitinized lips. In each the anterior lip is much more pronounced than the posterior one, and a process projecting downwards from the former somewhat constricts the lumen of the aperture. Each posterior spiracle opens into a large tracheal trunk; this first gives off several branches which run backwards for a short distance towards the middle of the abdomen, and then turning forwards goes

towards the cephalothorax. The whole surface of the ventral scutum bears plenty of coarse hairs.

Lamy* in his description of the tracheæ of the Oonopidæ utilizes as types *Dysderina loricata* (E. Sim.) and *Oonops pulcher* (Templ.). I know nothing of the former spider. I have however spent some time examining the respiratory organs of our indigenous Oonops, and cannot altogether agree with Lamy's account. He states that instead of two separate tracheal stigmata he sees a transverse slit dilated at its extremities into two orifices. Each of these possesses two strongly chitinized lips. The transverse slit leads into a deep fold in the integument which is prolonged at its extremities into two tracheal trunks. What really exists is as follows.

There undoubtedly is a transverse shallow groove running across the abdomen almost parallel with the rima genitalis. This again is undoubtedly dilated in a somewhat oval form at each lateral extremity. But the spiracles are perfectly distinct and independent. Each opens at the very extremity of the dilated terminations of the groove, from which it is distinctly separated by its strongly chitinous internal lip. Each is irregularly oval and bears a small projection on its anterior lip. Each leads into a separate tracheal trunk like those of *Ischnothyreus*. The groove itself is very shallow, and its floor is formed of rather thin chitin. It leads into no tracheæ, nor are its dilated ends spiracles. It is in fact the same structure as the curved chitinous band which in *Ischnothyreus* forms the posterior boundary of the ventral scutum, and upon which the posterior spiracles are placed. According to Lamy it is a median vestibule into the extremities of which the lateral tracheal systems open. This as I have shown is incorrect, since the spiracles are quite independent of one another, and each is separated from this transverse groove by well defined lips, and each is not (as shown in Lamy's figure) merely one of the chitinized extremities of a median, slit-like spiracle.

* *E. Lamy*, Recherches sur les Trachées des Araignées, pp. 177-179 and figure, 1902.

In the *male* an entirely different state of things obtains. The sexual aperture is here represented by a central thimble-shaped opening, the apex of which is in front. On each side of this the epigastric and ventral scuta have fused, thus obliterating the rima genitalis in its lateral portions. The point of juncture is marked on each side by the anterior spiracles. The ventral scutum is here short, flat, and is terminated by a curved suture connecting the two posterior spiracles. This is homologous with the posterior border of the ventral scutum of the female, and with the transverse depressed band which occurs in the female of *Oonops pulcher*. Immediately behind this, and only separated by it from the ventral scutum with which it is fused, is a huge conical scutum, which reaches down beyond the middle of the ventral surface of the abdomen. This may be described as a second ventral scutum, or in terms of human anatomy as an umbilical scutum. It is not represented in the female.

The arrangement of these scuta will be understood immediately if figures 10, 11, and 12 be examined. To make the drawings, most of the protecting and concealing hairs were removed.

The SPINNERS are six in number, two-jointed, terminal, and arranged in a close bundle. Just above them the integument of the ventral surface of the abdomen is strongly chitinous, and forms a distinct curved ridge. This, no doubt, represents feebly the inframammillary scuta possessed by several allied genera. It varies in development in different individuals, but is always difficult to see. The spinners thus appear to spring from a cup-shaped depression at the posterior end of the body. Their bases seem to be developed in membrane, which also appears to form a sort of pedicle from which they spring.

At the beginning of October Mr. Bagnall sent me a pair of adult examples of *Ischnothyreus velox*. He had discovered them in a hot conservatory at Alnwick. A day or two later I paid a visit to Dickson's nurseries at Chester, and had a hunt

for the species. Mr. Simcoe piloted me to a certain rather old greenhouse filled with tropical plants, such as Crotons, Tradescantias, etc. In this house I found one or two adult males, six or eight adult females, and many immature examples. The temperature of this hothouse ranges from 75° to 95° in summer, and from 55° to 65° in winter. It has, however, been known to go down as low as 48° without presumably injuring the spiders much. Most of the exotic plants reach Dickson's nurseries via the Continent, and Mr. Simcoe informs me that no direct importation from the tropics has been placed in that house for a very long time, if at all. In December Mr. Bagnall sent me a female and several immature specimens from a hothouse at Kew Gardens in London. The temperature of this house was about 75° on the occasion that he visited it. In the Chester locality the spiders were found running on the flower pots and benches, amongst the tan that strews the latter, and inside the flower pots on the stalks of the plants. They are exceedingly fleet of foot, and their movements somewhat resemble those of our indigenous *Oonops pulcher* (Templ.) That is to say, they consist of a series of rapid dashes made in different directions with momentary halts between.

The genus *Ischnothyreus* has a very wide range, as it is known to occur in the West Indies, West Africa, Ceylon, and the Philippine Islands. It is divided into several groups. One of these is the group of *I. aculeatus* (Sim.) to which the present species belongs. There are three other species in this group, of which *I. aculeatus* (Sim.) inhabits the Philippine Islands, and the other two Ceylon. Of these *I. lymphaseus* (Sim.) is distinguished by its much smaller size and its large dorsal scutum covering the whole abdomen. M. Simon* records the fact that this spider and another exotic Oonopid occur in the greenhouses of the Paris Museum, where they appear acclimatised. *I. bipartitus* (Sim.) has the dorsal scutum bisected by a dark-coloured transverse band. The present species is closely allied to *I. aculeatus* (Sim.), but the males can be

* Histoire Naturelle des Araignées, vol. ii., Supplément Général, p. 983.

distinguished from the fact that those of the latter species are described as possessing a pair of lateral processes springing from the labium and separating the maxillæ of each side from the anterior border of the sternum. Such are completely absent in *I. velox*. The females are distinguished by the spiny armature of the anterior femora. These joints bear some long, strong, spines on the inner side near the apex. There are three of these in the females of *I. aculeatus*, and two only in the present species. M. Simon kindly examined my specimens. He informed me as to the difference in the females, and stated that in his opinion the present specimens belonged to an undescribed species. It has been found, as before stated, in London, Chester, and Alnwick, and is thus at least wide-spread in Britain. The fact that individuals of all ages were found shows that it is breeding in this country. It is almost certain that it would be found in other localities if hot greenhouses were investigated. It is, of course, not indigenous to this country, but appears to be obtaining a footing here; at any rate it is as much of a native as *Hasarius adansonii* (Sav.) and possibly *Theridion tepidariorum* (C. L. Koch) and *Pholcus phalangioides* (Fuess.) It is so unlike anything else we possess, and so interesting in its structure, that I have ventured to deal with it more fully than would have been the case had it been more commonplace.

Bianor ænescens (Sim.) Plate IV., figs. 1, 2, 3 and 30 d.

Mr. W. H. Bennett obtained two females of this interesting spider by sweeping herbage near Hedley in Surrey during June, 1907. The species has occurred in France, Germany, Poland, Galicia, and Sweden, but this is its first British record. The spider is of a somewhat elongated form, and of a dark grey colour. Under the microscope it is seen to be covered with a coating of short, somewhat squamous, hoary hairs. The abdomen above shows a very indistinct median pattern. This consists of a central fascia with three or four consecutive lateral processes. Between these processes are a series of

yellowish brown spots. The first two of these are single, but the posterior ones are multiple, the spots being arranged in oblique rows, running downwards and outwards, and forming with their fellows of the opposite side very indistinct and imperfect chevron marks. In the centre of the cephalothorax, between the two posterior eyes, is a small oval depression. The three posterior pairs of legs are fairly slender, but the anterior pair is much modified. In each leg the femur, patella, and tibia are very much thickened, and being nearly black in hue contrast strongly with the metatarsus and tarsus, which are slender and of a pale yellowish brown colour. Each tibia and metatarsus bears beneath two parallel rows of strong spines, of which three pairs are carried by the tibia, and two by the metatarsus. The vulva is quite characteristic, and on the plate I indicate the natural size of the animal, which is about 4 mm. in length. The Rev. O. Pickard-Cambridge and Professor Kulczynski, to each of whom I have submitted this spider, both concur as to its identity. The vulva somewhat resembles that figured by Bösenberg*, but it is not easy to believe that his figures of the spider from above, and of one anterior leg, refer to the same species.

Maro minutus (Camb.) Plate IV., figs. 21, 22, 23, 24, 25.

Three males of this small species were captured in April and May at Huddersfield by Mr. Falconer. He had previously discovered the female, which was described and figured by Mr. Cambridge.† These males are thus new to science. They resemble the female in size, colour, and facies, and there appear to be no marked secondary sexual characters. The cephalothorax is rounded, and bears no ocular eminence or occipital gibbosity. Postocular depressions or striæ are not present. The relations of the eyes are similar in the two sexes. The palpi, however, are quite characteristic, this being specially noticeable when they are viewed from below. The

* Die Spinnen Deutschlands, fig. 652, A, B, and C.

† "On Some New and Rare British Arachnida," Proc. Dors. Field Club, vol. xxvii., 1906, pp. 86–88, figs. 12–18.

apex of the palpal organs then shows three prominent teeth arranged in a rather peculiar position (see fig. 23). The male is about 1·1 mm. in length. Mr. Falconer also sent me a female obtained in Huddersfield this year, and I here give figures of its vulva. This was quite normally placed, but in the type described by Mr. Cambridge‡ it appears to have been situated very far back on the ventral surface of the abdomen. My specimen also seems rather larger than the one he figured, which was under 1 mm. in length. The absence of both spines on tibiæ IV., the absence of cephalic eminences or striæ in the male, the non-coriaceous integument, the short heart-shaped sternum, and the simple palpi of the female, would seem to point a close relationship between the genus *Maro* and the *Neriene* group of M. Simon.

Maro Falconerii (sp. nov.). Plate IV., figs. 16, 17, 18, 19, and 20.

This little spider closely resembles *M. minutus* (Camb.). It is, however, slightly smaller, my largest example only measuring 1 mm., whilst the smallest was barely ·9mm. in length. In facies, colour, arrangement of eyes, relative length of legs, etc., the species are closely similar, the present however being, if anything, of rather a clearer yellowish brown than its congener. There is one secondary sexual character. viz., a strong prominent tooth on the anterior face of the basal joint of each falx. This is situated near the groove in which the fang lies, but in front of its anterior border. It is found only in the male, and its size varies considerably in different individuals. It is, however, quite easy to see in all my specimens of that sex.

The females of this species and *M. minutus* (Camb.) are easily distinguished by the total dissimilarity of the vulvæ—that of the present species being a trifle like the corresponding structure in *Tapinocyba præcox* (Camb.). This latter spider looks large and clumsy by the side of *M. Falconerii*.

‡ Op. cit.

The males can be separated readily by the presence of the aforesaid tooth on the falces, and by the differences in the palpi. If these appendages be viewed from below, it will be seen that the corneus apophyses, and teeth situated at the apex are quite differently arranged from the corresponding organs in *M. minutus* (see fig. 17). The tibiæ of the palpi, too, are quite different, those of *M. Falconerii* being a little produced over the tarsi; and the whole palpi are in the present species much slenderer and less massive than in its congener. Cephalic eminences and post-ocular striæ are not present.

I found both sexes of *Maro Falconerii* amongst moss in Delamere Forest, Cheshire, in May, 1907. After I had discovered that the species was new to science, Mr. Falconer sent me three examples of the female. One of these he had found in June, 1906, in Delamere Forest, whilst staying with me, the other two he obtained near Huddersfield in April, 1907. I have pleasure in connecting his name with this small and very interesting creature, which appears to me to be congeneric with *Maro minutus* (Camb.).

Gongylidiellum paganum (Sim.) Plate IV., figs 14 and 15.

A male and several females were sent to me by Mr. D. R. Pack-Beresford, by whom they were found on long grass and low bushes growing under fir trees in March, 1907, at Bagenalstown in County Carlow. The same gentleman also sent me several examples of both sexes which he had obtained at the same spot amongst leaf debris in the following October. Mr. Cambridge* records the occurrence of a male captured near Huddersfield by Mr. Falconer. Later, Mr. Falconer sent me a female which at the time I supposed to be of this species, but which owing to doubts I did not record as such. I have compared this example with those Mr. Pack-Beresford caught in the company of males of *G. paganum* (Sim.), and there is no doubt as to their identity. I now record the occurrence of the

* "On New and Rare British Spiders," Proc. Dors. Field Club, vol. xxiv., 1904, p. 165, fig. 7.

female in Yorkshire, and of both sexes from County Carlow. I also give figures of the vulva, as there are none in British literature. *G. paganum* is recorded by M. Simon* for several localities in the South of France.

Epiblemium affinitatum (Camb.) Plate IV., figs. 4, 5, 6, and 30a.

A male and female were captured by Mr. W. H. Bennett on the trunk of a tree in Richmond Park, Surrey, in June. The species was described (but not figured) by the Rev. O. Pickard-Cambridge† from a male obtained in Dorsetshire in 1860. The female is new to Britain, and the present male is only the second on record for this country. I give figures of the palpi, and it will be seen how entirely the tibial apophyses differ from the corresponding structures in *E. scenicum* (Clerck) and *E. cingulatum* (Panz.). I also give drawings of the vulvæ of all three spiders to illustrate the fact that there is no difficulty in distinguishing the females of our three species of *Epiblemium*. Further, I show the comparative lengths of all three, of which the present is distinctly the smallest, my male being only 3·25 mm. in length, whilst examples of *E. cingulatum* and *E. scenicum* measured 5 mm. and 6 mm. respectively.

On sending these spiders to Mr. Cambridge, he at once recognised the male as being identical with his type of *E. affinitatum* (Camb.). The female was new to him, and as it was captured in the same locality as the male, and corresponds with it in general characters, they may reasonably be considered as conspecific. The specimens were then dispatched to Professor Kulczynski, who declared them identical with *E. zebraneum* (C. L. Koch.) But the original types of this species are not available; probably they are lost. Mr. Cambridge, however, has compared the present examples with *E. zebraneum* (C. L. Koch—L. Koch), *E. zebraneum* (C. L. Koch—E. Sim.), *E. tenerum* (C. L. Koch—Camb.) and other Continental species, and states that *E. affinitatum*

* Les Arachnides de France, tome v., p. 603.

† Trans. Linnæan Society, vol. xxvii., p. 399.

(Camb.) is distinct from all these. All that can be said therefore is that it is identical with *E. zebraneum* (C. L. Koch—Kulcz.), and therefore is rightly recorded under Mr. Cambridge's name.

Typhochrestus digitatus (Camb.). See figs. 26, 27.

Dr. R. de Lessert* has shown that *T. digitatus* (Camb.) is identical with, and has priority over, *T. dorsuosus* (Camb.), and this is confirmed by Mr. Cambridge himself in letters to Dr. de Lessert and to myself.

Cnephalocotes pusillus (Menge-Carp.) } Plate IV.,
Typhochrestus dorsuosus (Camb.) } figs. 28, 29.

I have been aware for some time that the supposed female of the former species figured by Dr. G. H. Carpenter† really belonged to the latter, and that there is no British description or figure of that sex. The species was described under *Microneta* by Menge‡ in 1868. His specimens were found at Heiligenbrunnen and Johannisberge by himself. He records both sexes, and figures amongst other points the vulva of the female. I have never seen this figure, but Mr. Cambridge most kindly copied it, and let me have his copy. It is very unlike what really obtains, and I believe Menge's figures relate to some other species. The species was next found at Nuremberg, and was redescribed by Mr. Cambridge§ under the name of *Erigone sila*. He did not however figure the vulva of the female. Simon‖ describes the female, but all his figures only relate to the male. Chyzer and Kulczynski** only mention and figure the male.

Dr. Carpenter's specimens were all found by myself at Southport, which is the only known British locality. The species occurs amongst the starr or marram grass on the sandhills,

* Annales de la Société Zoologique Suisse, tome 15, fasc 1, p. 109, 1907.
† Annals and Mag. Nat. Hist., Ser. vii., vol. vi., Aug , 1900.
‡ Preuss. Spinn. III., p. 232, pl. xlv., f. 130.
§ Pro. Zool. Soc., Lond., 1872, p. 753. pl. lxv., f. 7.
‖ Les Arachnides de France, tome v., p. 706.
** Araneæ Hungariæ, vol. ii., p. 119, pl. iv., fig. 41.

and is there accompanied by *Typhochrestus digitatus* (Camb.). At first I associated the females of this spider (then known as *T. dorsuosus*, Camb.) with the males of *Cnephalocotes pusillus* (Menge), and Dr. Carpenter referred to and figured them under that name. Later I found at Southport the real female of *Cnephalocotes pusillus* (Menge), and here describe and figure it. It is certainly new to Britain, and probably to science, as I believe M. Simon has, like Dr. Carpenter, described the female of *T. digitatus* (Camb.) as that of the present species. I am led to this belief by reading his description of the vulva, and comparing it with that of both species. I now figure the vulva of each species.

The males of *Typhochrestus digitatus* have occurred in a good many localities. I have seen them from Southport, Wallasey, Glamorgan, North Wales, and Yorkshire; they are in these localities always accompanied by this female, which I have also found in Dorset (Portland), and near Hexham, in Northumberland. As before stated *C. pusillus* (Menge) has only occurred in Britain on the sandhills round Southport, where I have myself obtained both sexes. The two females are very easily separated both by general and sexual characters. Both are of about the same size, but *C. pusillus* is of squat form, the abdominal integument being coriaceous and forming rather indefinite dorsal and ventral scuta. Its sternum is very broad, the prolongation between the posterior coxæ being much broader than either of these joints. The legs are stout and thick, and all the tarsi, but especially the first pair, are slightly fusiform. The anterior row of eyes is, when viewed from the front, slightly but distinctly procurved, that is to say curved with the convexity behind. The posterior row, viewed from above, is curved in the same direction, but more strongly so.

In *T. digitatus* (Camb.) all these points are reversed. The spider is slenderer, with no coriaceous integument, and thin legs, the tarsi of which are not fusiform. The sternal prolongation is not wider than either of the posterior coxæ which it separates. The anterior row of eyes viewed from the front

is practically straight, and so is the posterior row seen from above. The facies of these spiders is quite different, as one would expect. The vulvæ, however, are so dissimilar that there is not the slightest difficulty in distinguishing the species by those structures alone. I here figure the vulvæ of both.

Styloctetor uncinus (Camb.)*
Styloctetor broccha (L. Koch—Carp.)†

In 1904 I obtained several examples of a small spider by shaking moss on the summit of Scafell Pike. These were described by Mr. Cambridge under the former of these names. In 1905 the same species occurred to me in similar situations on the summit of Snowdon. Last year Dr. R. de Lessert kindly sent me some specimens of *S. broccha* (L. Koch) from Switzerland. These were strikingly unlike the British species. I dispatched a pair of Cumbrian examples to Dr. G. H. Carpenter, who compared them with the Irish specimen described under the latter name. He states that the two supposed species are identical, and therefore as *S. broccha* (Koch) is quite different from either of them, its name must, for a time at all events, disappear from the British list.

In addition to the above, the following interesting Arachnids have been observed during the year.

ARANEÆ

Prosthesima rustica (L. Koch). Mr. Bennett obtained an adult male at Hastings in May. It was found on the cliffs at the roots of herbage.

Drassodes sylvestris (Bl.). An adult male was found at Guestling near Hastings in April. Its captor, Mr. Bennett, found it amongst dead leaves.

Drassodes pubescens (Thor.). I found a single male amongst herbage at Beer near Sidmouth in June.

* Proc. Dors. Field Club, vol. xxvi., 1905, p. 65, 66, 67, plate A, figs. 22, 23, 24, 25.

† A List of the Spiders of Ireland, p. 165, 166.

Gnaphosa anglica (Camb.). A female was found amongst moss in a swamp in Delamere Forest on August 28th. Immature individuals had previously been found in the same locality.

Clubiona corticalis (Walck.). Adults of both sexes are not rare under the bark of trees growing on the banks of the river Dee. The males become mature at the end of April. Adult females may be found throughout the summer.

Clubiona neglecta (Camb.). Adult males were found at Sidmouth in June, and an adult female in August at Hawarden near Chester.

Micaria scintillans (Camb.). Females were found in June under stones on the Isle of Portland.

Agrœca inopina (Camb.). A mature male at the roots of herbage at Hastings in March. Mr. Bennett.

Xysticus pini (Hahn.). Common locally on gorse bushes in June. Sidmouth.

Philodromus lineatipes (Camb.). Mr. A. Newstead obtained a very young individual in August. New Forest.

Philodromus fallax (Sund.). Adults of both sexes on the sandhills at Wallasey on April 24th. In the previous year I had found the males almost over on May 9th.

Hyctia Nivoyii (Luc.). Mature females at Sidmouth in South Devon, and from Hastings.

Euophrys æquipes (Camb.). A melanic specimen of the male was found in June on a tree trunk in Richmond Park, Surrey. Mr. Bennett.

Phlegra fasciata (Hahn.). Two adult females in June. Portland.

Cœlotes atropos (Walck.). An adult female under a stone near Sidmouth in South Devon. June.

Cœlotes terrestris (Wid.). Mr. Cambridge* records this species as having been taken by me in Northumberland. This is a mistake, the examples mentioned having been found by Mr. Bennett near Hastings, as previously recorded by me.†

Hahnia candida (Sim.). A mature female in June. Portland.

Hahnia pusilla (C. L. Koch). Adults of both sexes in May, and again in September, in Delamere Forest, Cheshire.

Dolomedes fimbriatus (Walck.). Mr. A. Newstead obtained several immature individuals in August in the New Forest.

Lycosa arenicola (Camb.). Both sexes were found amongst stones just above high water mark at Sidmouth and Beer. June.

Pholcus phalangioides (Fuess.). Outhouses in June. Sidmouth.

Theridion impressum (L. Koch). Adults of both sexes were obtained by beating gorse bushes in July. Delamere Forest.

Theridion aulicum (C. L. Koch). A male and two females were beaten from gorse bushes on the Sidmouth cliffs in June.

Theridion Blackwallii (Camb.). An immature female was captured by Mr. Bennett in Richmond Park, Surrey. June. I submitted this example to Mr. Cambridge.

Euryopis flavomaculatum (C. L. Koch). This spider occurs amongst moss and dead leaves, and is adult in May and June. Mr. Bennett found it at Bexhill, Sussex, and it also occurred in Delamere Forest.

* "On Some New and Rare British Arachnida," Proc. Dorset Field Club, vol. xxviii., 1907.

† "On Some Rare Arachnids," Proc. Chester Nat. Hist. Soc., part vi., no. i., 1907.

Laseola inornata (Camb.). Adults of both sexes were found under stones on the Isle of Portland on June 11th. Only three males were obtained, but the females were numerous.

Laseola jucunda (Camb.). Three males and three females were taken in the same situation, and on the same date.

Crustulina sticta (Menge). Numerous adult females and immature males were found by Mr. Bennett under tidal refuse at Rye harbour in the autumn of 1907. All were of the black form.

Robertus neglectus (Camb.). Two mature males were captured amongst decaying hay on September 1st by Mr. Britten near Penrith.

Ceratinella scabrosa (Westr.). Both sexes occurred in May near Chester, and Mr. Bennett in the same month obtained males and females near Hastings.

Troxochrus cirrifrons (Camb.). A single male amongst litter in a stable in Delamere Forest. This is the first local record for this species, and I have not yet found *T. scabriculus* (Westr.) in the district, though it occurs at Wallasey on the sandhills.

Areoncus crassiceps (Westr.). A mature male and several females were found amongst moss at Newton Moss near Penrith at the end of June. Mr. Britten was the captor.

Diplocephalus Beckii (Camb.). A mature female from Egglestone in Teesdale by Mr. Bagnall, and another by myself in a barn in Delamere Forest. Both sexes by Mr. J. C. Varty-Smith from Edenhall, Cumberland.

Tapinocyba insecta (L. Koch.). A single female from Bexhill, Sussex, by Mr. W. H. Bennett. The specimen was obtained amongst dead leaves in August. The only previous British records were Northumberland and Yorkshire.

Tapinocyba præcox (Camb.). A female from Delamere Forest on April 28th, and a male from the same locality on November 7th. This little species is found amongst moss.

Tapinocyba subitanea (Camb.). Both sexes were obtained amongst litter in a barn in Delamere Forest in September. I have also received the species from Cumberland and Sussex.

Lophomma laudatum (Camb.). A single female at Sidmouth in June.

Styloctetor penicillatus (Westr.). An adult male at Chester on September 24th, and another from Edenhall, Cumberland, in October.

Entelecara Jacksonii (Camb.). An adult male in Delamere Forest on April 19th, and another on August 28th.

Thyreosthenius biovatus (Camb.). Mr. Bagnall obtained an adult male and a young female at Rowlands Gill, in the Derwent Valley, County Durham. These were found amongst herbage. There were no nests of *Formica rufa* in their immediate neighbourhood, and no specimens of that ant were observed in the locality.

Tigellinus furcillatus (Menge.). An adult female was found by Mr. Falconer, near Staward Peel, Allendale, Northumberland. A fine addition to the fauna of the county.

Trichoncus saxicolus (Camb.). Adults of both sexes under stones and amongst herbage on the Isle of Portland. June 11th.

Tmeticus firmus (Camb.). Both sexes occurred in Delamere Forest, where the females may be found throughout the year. A male, scarcely adult, was obtained on August 5th, and subsequently examples of the same sex were taken on August 18th and September 28th.

Centromerus emptus (A. R. J.) This spider was again found at Oakmere, Cheshire, on March 6th, April 19th, and November 7th. Adult males were obtained on each occasion. They seem to be able to withstand the rigours of winter, as they were not rare on the first date.

Porrhomma microphthalmum (Camb.). Mr. Pack-Beresford found a female at Fenagh, County Carlow, in the winter. Both sexes were also obtained by him in the Island of Lambay. These were, however, recorded as belonging to the next species.*

Porrhomma errans (Bl.). Mr. Pack-Beresford found two females at Fenagh in spring. They were running on iron railings. These possess the distinct abdominal pattern and strong metatarsal spines noted by the late F. O. P. Cambridge.†

Taranucnus setosus (Camb.). A male at Delamere on April 28th, and both sexes on May 22nd, in the same locality. They were found amongst long grass and herbage, on the swampy banks of the lake at Hatchmere.

Linyphia insignis (Bl.). Mr. Bennett found both sexes freely at Hastings in October. This spider is supposed to be rare in the southern counties. A single female occurred in Delamere Forest in September.

Epeira Redii (Scop.). Females occurred in June amongst tall herbage on the cliffs at Sidmouth.

Dictyna variabilis (C. L. Koch). Both sexes near Hastings in June. Common in the same month on bushes and herbage at Sidmouth.

PHALANGIDEA

Sclerosoma quadridentatum (Cuv.). Immature individuals in June. Sidmouth. Adults also from Hastings.

Sclerosoma romanum (L. Koch). Mr. Bennett obtained examples by searching at the roots of herbage in March and November. Hastings.

Oligolophus Meadii (Camb.). Immature individuals from Penrith in August. Mr. Britten. Also in Delamere Forest.

* Irish Naturalist, vol. xvi., p. 63, 1907.

† Annals and Mag. Nat. Hist., vol. xiii., series 6, 1894, p. 100.

Oligolophus Hansenii (Kræp.). Mr. Bennett found an adult female at Hastings in October. Mr. Britten took both sexes at Penrith in the same month. His examples were found on the tips of the branches of conifers.

Anelasmocephalus Cambridgii (Westr.). A single specimen was found under a stone on the Isle of Portland. Mr. Cambridge* records this species as having been taken by me in Cheshire. The specimens were really found by Mr. Bennett in Sussex.

CHERNETIDEA

Chernes rufeolus (Sim.). This form appears widely distributed, and occurs amongst stable refuse. Mr. Falconer obtained a male at Haltwhistle, Mr. Britten both sexes at Penrith, and I found both sexes in a cowshed in Delamere Forest.

Chernes nodosus (Schranck). Mr. Shufflebottom of Chester took between twenty and thirty specimens in Hoole. All these were attached to the legs of flies caught on fly papers. Fly papers in several other parts of Chester did not yield any specimens of the Arachnid. All these examples were obtained in August and September. All were attached to the legs of the housefly, and in no case was any other Chernetid found in such a situation. On one fly were two examples of *C. nodosus*. At the end of September when the wet weather commenced the supply suddenly ceased, although flies were still numerous. In December, Mr. F. J. Cole, of University College, Reading, sent me fifty-five examples of this species. These were not taken by himself, and he does not know where they were found.

Chernes cimicioides (Fabr.). One adult and two very young examples were found under the bark of an old oak tree growing on the banks of the River Dee. September.

* "On Some New and Rare British Arachnida," Proc. Dorset Field Club vol. xxviii., 1907.

Chiridium museorum (Leach). Mr. Varty-Smith found several adults under pieces of mortar in a barn at Newton Arlosh, Cumberland, in October. In September I obtained several specimens amongst refuse in the same cowshed in which *C. rufeolus* (Sim.) occurred. The present species occurred upstairs in the loft, and the latter on the ground floor. Fly papers were hung up in both situations, and on them flies of various species were caught, but in no case was either of the species of Chernetid found attached to them.

Roncus lubricus (L. Koch). A single example from Reading. Mr. F. J. Cole.

Chthonius tetrachelatus (Preyss.). Mr. Bagnall found both sexes under boards in cool greenhouses at Newcastle in October. In November I obtained examples in similar situations in Dickson's Nurseries, Chester.

Chthonius tenuis (L. Koch). Mr. Bennett found about a dozen examples amongst fallen pine needles near Hastings, and at Bexhill. He also obtained an example at Esher in Surrey. The species occurred both in autumn and early summer.

Chthonius Rayii (Koch), Mr. Bagnall obtained this animal in July at Bishopston in Clydesdale. I found one or two specimens in June in the Isle of Portland. All these examples were found under stones.

APPENDIX

Mr. Bagnall sent to me in December, 1907, four examples of an interesting Arachnid which he obtained in a hot conservatory at the Botanic Gardens, Kew. I imagined that these might be Tartarides, so applied for assistance to Professor H. J. Hansen of Copenhagen. He most kindly sent me his monograph of the group.* Subsequently I sent him one of the specimens, and he stated that although closely related to *Trithyreus Cambridgii* (Thor.) it belonged to an undescribed species. It was then too late to figure it in the present paper, but I resolved to describe it in an appendix, and hope to publish figures soon. Unfortunately all the specimens were females, and in this group the males are much more distinct from one another than are the examples of the former sex. I hope soon to obtain males from Kew. In January, 1908, Mr. H. Donisthorpe sent a female of the same species obtained by himself at Kew to Mr. Cambridge. This Mr. Cambridge sent to me, and it is undoubtedly conspecific with Mr. Bagnall's examples. It too is a female. The Tartarides are a small group, only fifteen species being previously known. They are related to the long-tailed Thelyphonidea. There is only one family known—the Schizomoidæ (Hansen). This is divided into two very similar genera, *Schizomus* (Cook) and *Trithyreus* (Kraepelin). The Tartarides are not indigenous to Britain or Europe. They have been found in California, Venezuela, West Indies, Sierre Leone, the Seychelles, Ceylon, Burma, Singapore, Malacca, the Philippines, New Guinea, and New Britannia. *Trithyreus Cambridgii* (Thor.), to which the present species is closely related, was found in Burma.

Genus TRITHYREUS (Kraepelin)

The second thoracic tergite shows a longitudinal, median, membranous suture. The flagellum (or tail-like appendage of the abdomen) is three-jointed.

* The Tartarides, a tribe of the order Pedipalpi. By H. J. Hansen and W. Sörensen. London, William Wesley and Son, 28, Essex Street, Strand; also in Uppsala, Paris, and Berlin, 1905.

Trithyreus Bagnallii, sp. nov.

Length.—An adult female measured 3·1 mm. exclusive of the flagellum.

Colour.—The tergites of the caput, thorax, and abdomen are of a rich, shining dark brown, and have a slightly granular surface. The first abdominal tergite, however, is an exception, being very pale and difficult to see. The 8th and 9th abdominal sternites are almost as dark as the tergites, but all the other sternites, as well as the maxillæ and coxæ, are of a pale greyish yellow-brown. The 10th, 11th, and 12th segments of the abdomen form complete rings not divided into tergites and sternites. These segments, and the upturned flagellum they carry, are darker than the sternites, and paler than the tergites. The 12th, or last segment, bears on each side of the anus the dome-like opercula closing the apertures of the glandulæ odoriferæ. The soft parts separating the chitinous tergites and sternites, and intervening between them and the coxæ and between the various joints of the legs, are of a dirty whitish brown hue.

Flagellum.—This is three-jointed, and measures about 2 mm. in length by about ·5 mm. in breadth. It is cylindrical, or nearly so, in shape. The first joint is rather short and bears no setæ. The second joint is very short and bears eight or nine long setæ, each rising from a dome-like base. The third joint is longer than the sum of the other two, forming about three-fifths of the organ. It bears numerous long setæ.

Eyes.—Two ocelli are present, placed on the caput above the bases of the palpi. Each is oval, but rather irregularly, being narrower in front than behind. Each is moderately convex when viewed in profile.

Palpi.—Not very slender. About 1·49 mm. in length exclusive of the maxillæ. Each is thus less than half the length of the body. The *trochanter* measures about ·3 mm. in length. The anterior border is straight. The inferior border is broadly

produced in front, but this production is very short, being soon obliquely truncated. The truncation is parallel with the lower border of the patella when that joint is flexed fairly strongly on the femur. The posterior part of the lower border is gibbous, and provided with setæ. The base of the trochanter is constricted, stalk-like, and very narrow. The *femur* is ·33 mm. long by ·175 mm. broad. The lower margin is convex, the apex of the hump formed being about the centre. The *patella* is ·33 mm. long by ·12 mm. broad. The *tibia* is ·33 mm. long, the *tarsus* ·15 mm. long; and the *terminal claw* is curved, and about ·075 mm. in length.

The FIRST LEGS are long, slender, and palpiform. The lengths of the joints are as follows:—*Trochanter* ·25 mm., *femur* ·8 mm., *patella* ·95 mm., *tibia* ·7 mm., *metatarsus* ·25 mm., *tarsus* ·35 mm. The terminal joint of the tarsus is longer than the next two taken together, but not as long as the next three. The total length of each first leg is 3·3 mm.

The FOURTH LEGS.—The total length is 2·75 mm. The lengths of the joints are as follows:—The *trochanter* ·25 mm. The *femur* ·75 mm. by ·38 mm. broad; the femora are thus enormously thickened, and are hardly twice as long as broad. The *patella* and *tibia* together measure ·9 mm. The *tarsus* and *metatarsus* together measure ·85 mm. In colour the legs are brown, the femora, especially the fourth, being dark like the tergites, whilst the terminal joints are pale like the sternites.

Trithyreus Bagnallii differs from all known Tartarides (save one) in its possession of distinct, convex, vitreous ocelli. Of the other species some are quite blind, whilst others possess flat, badly defined eye-spots. *Trithyreus Cambridgii* (Thor.), however, possesses true eyes, but these are more convex than in the present species, and quite round. Professor Hansen informed me of this in a letter; he does not mention it in his monograph.*

* Op. cit.

T. Cambridgii also differs from the present species in the fact that its palpi and fourth femora are slenderer, the latter being more than two and a half times longer than broad (deep). A further difference exists in the trochanter of the palpus, which in Thorell's species has the anterior part of its inferior border produced into an angular prominence. In the present species this is obliquely truncated. It is unfortunate that the males of neither species are known, as in that sex the flagellum is much modified and extremely different in closely allied species. As regards the present species I hope soon to obtain, describe, and figure the male.

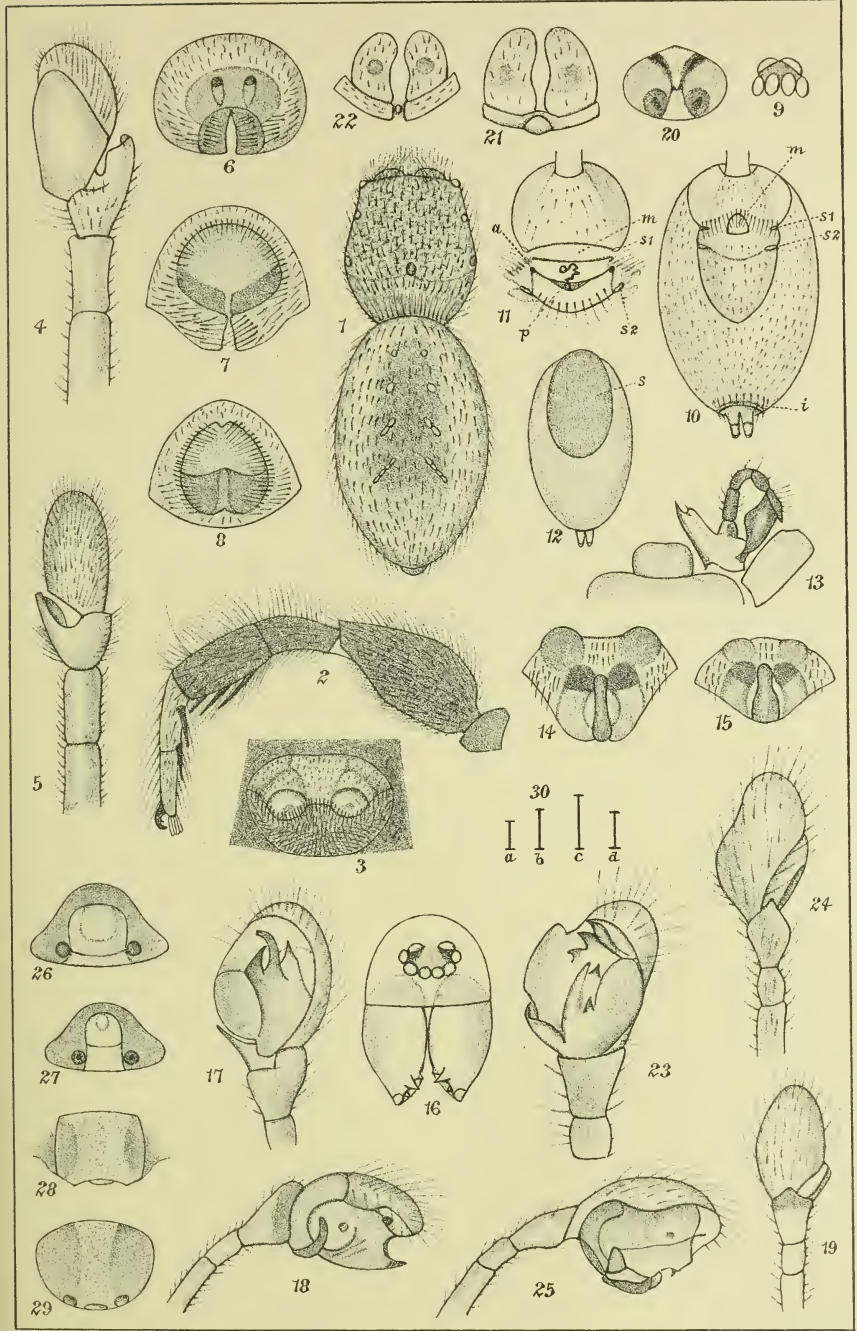
EXPLANATION OF PLATE IV.

1. Bianor ænescens (E. Sim.). Female from above, all appendages removed.
2. ,, One of the anterior legs seen in profile.
3. ,, Vulva from below.
4. Epiblemium affinitatum (Camb.) Left palpus from below.
5. ,, ,, Left palpus from above,
6. ,, ,, Vulva from below.
7. Epiblemium scenicum (Clerck). Vulva from below.
8. Epiblemium cingulatum (Panz.). Vulva from below.
9. Ischnothyreus velox, sp. nov. Eyes from above.
10. ,, ,, Abdomen of male from below, s_1 and s_2 spiracles, *m* sexual aperture, *i* inframammillary ridge.
11. ,, ,, ,, Upper part of abdomen of female from below, s_1 and s_2 spiracles, *m* rima genitalis, *a* aperture of tubular gland, *p* boat-shaped process.
12. ,, ,, ,, Abdomen of male from above, *s* dorsal scutum.
13. ,, ,, ,, Maxillary palpus and labium of the male.
14. Gongylidiellum paganum (E. Sim.). Vulva of female from below and in front.
15. ,, ,, The same from below.
16. Maro Falconerii, sp. nov. Caput and falces of male from the front, showing the tooth.
17. ,, ,, ,, Right palpus of male from below.
18. ,, ,, ,, Ditto from outer side.
19. ,, ,, ,, Ditto from above.
20. ,, ,, ,, Vulva of female from below.
21. Maro minutus (Camb.). Vulva of female from below, and rather in front.
22. ,, ,, ,, Vulva of female from below.
23. ,, ,, ,, Right palpus of male from below.
24. ,, ,, ,, Ditto from above.
25. ,, ,, ,, Ditto from outer side.

26 and 27. Typhochrestus digitatus (Camb.). Vulvæ of two different individuals from below.

28 and 29. Cnephalocotes pusillus (Menge). Vulvæ of two different individuals from below.

30. Indications of natural size of—
    a. Epiblemium affinitatum (Camb.), male.
    b. Epiblemium cingulatum (Panz.), male.
    c. Epiblemium scenicum (Clerck), male.
    d. Bianor ænescens (E. Sim.), female.



A Randell Jackson del. W. West lith.

RARE ARACHNIDS.

The Glacial Phenomena of the Country between the Tyne and the Wansbeck. By J. A. Smythe, M.Sc., Ph.D. (Armstrong College, Newcastle-on-Tyne).

[Received Dec., 1907].

The tract of country to be described in this paper forms roughly a rectangle 18 by 12 miles, bounded on the north by the Wansbeck, on the west and south by the land within the drainage area of the North Tyne and Tyne proper, and on the east by the Northumberland coalfield, or at least by that portion of it which has been fully described, so far as its superficial deposits are concerned, by Dr. D. Woolacott.* Topographically this area is very simple, for the land-surface slopes in the main from west to east, and the streams follow the same direction. Almost all the drainage is carried away by the river Blyth and its most important tributary the Pont. Two streams, the Dewley Burn and the Ouseburn, call for notice here, since the country drained by their upper branches exhibits glacial characteristics similar to that within the drainage-area of the Blyth. The geological structure corresponds to this simple topography; the rocks belong to the upper Bernician, the Millstone Grit and a portion of the Coal Measures Series of the Carboniferous System, and they dip on the whole to the south or south-east. Resting on these is a variable thickness of drift, especially thick in the low-lying lands to the east. The Great Whin Sill crops out just to the west of the area.

The Glacial Phenomena may be considered under several heads, viz:—Striations, Roches Moutonnées, the Drift, and Forsaken Water-Courses.

I.—Striations.

These have been frequently noticed by different observers, but little record seems to have been kept of their directions. During the past few years the following striæ have been

* Superficial Deposits and Pre-Glacial Valleys of the Northumberland and Durham Coalfield, Quar. Jour. Geol. Soc., lxi., pp. 64-96 (1905).

observed, all upon Coal Measures sandstone, and preserved from weathering by a capping of drift.*

Place	Lat. and Long.	Direction of Striæ.	
Kenton Quarry ...	55° 1′ 10″ 1° 39′ 30″	S.S.E. to S.E.	
Brunton Quarry...	55° 2′ 12″ 1° 37′ 45″	7° S. of E. 10° N. of E.	main. subsidiary.
Burradon Quarry	55° 3′ 5″ 1° 34′ 10″	28° S. of E.	
Burradon Old Quarry ...	55° 2′ 55″ 1° 33′ 55″	44° S. of E. 20° S. of E. 56° N. of E.	In order from oldest to most recent.

From these data it would appear that the general movement of the ice-sheet which produced the striations was to the south-east, though, of course, we have no means of finding out at what stage in the Glacial Period they were made.

II.—Roches Moutonnées.

Owing to the yielding nature of the rocks which crop out in this area, well smoothed and rounded rock surfaces are seldom met with. The best examples known to me are on Shafthoe Crags, where large patches of gritty sandstone show the characteristic appearance, although the groovings and striations which must have accompanied it have long since been obliterated by weathering.

At Killingworth, a scarped face of highly-dipping sandstone, free from drift, gives undoubted evidence of planing by ice-action. This is shown still more clearly at Kenton Quarry, where, thanks to a protective covering of boulder clay, the original ice-worn surface has been excellently preserved. The "post" there dips at 10° S.E., and the N.-S. section showed, a short while ago, a clean-cut convex curve at the scarped end, instead of the notched outline which would result from sub-aerial denudation. The surface of the rock under the clay was striated, and the clay itself charged with scratched boulders. The ice must have moved in the main from north to south to produce the effect, and this direction agrees with that of the striations given in the above table.

* See Report of Boulders' Committee, Univ. Dur. Phil. Soc., vol. ii., p. 271.

Although it is probable that most of the elevated rocky tracts in this district are similarly *moutonnéed*, yet for various reasons the point is difficult to establish in particular cases, so that only those examples have been described in which the evidence seems complete.

III.—The Drift.

The distribution of the superficial deposits primarily produced by moving ice is very irregular, both with respect to the extent of surface covered by them, and to their thickness in particular places. It is obvious, even on a cursory inspection of the country, that the higher land is relatively free from these deposits when compared with the lower-lying land. Large tracts of country about Whalton, Bolam, Belsay, Shafthoe, Inghoe, and Mootlaw, for example, are quite free from cover, while lower down, in the basin of the Pont and Blyth, one could walk for miles without encountering any exposure of rock.* A more accurate (even though somewhat approximate) estimate of the relative surface-distribution of rock and drift, and the dependence of this upon the contour, can be got by planimetric measurements on the Drift Maps of the Ordinance Survey.

Such measurements have yielded the following results for the country within the drainage-area of the Blyth as far as Stannington, together with that drained by the upper reaches of the Ouseburn and Dewley Burn :—

Height of Land in Feet.	Area in Square Miles of		Percentage Areas of	
	Drift.	Rock.	Drift.	Rock.
Under 200	16·5	0·2	98·8	1·2
Between 200 and 300 ...	30·7	2·5	92·5	7·5
,, 300 and 400 ..	19·6	3·4	85·2	14·8
,, 400 and 500 ...	19·8	3·9	83·6	16·4
,, 500 and 600 ...	11·1	2·6	81·0	19·0
Over 600	6·9	4·1	62·7	37·3

The well-characterised components of the drift in these parts

* Note that hereafter "rock" will be used in the ordinary sense of "living" rock, to distinguish it from the drift or superficial deposits.

are five in number, viz. :—Boulder Clay or Till, Prismatic Clay, Later Gravels, Erratic Blocks, and Glacial Sands.

The *Boulder Clay* is always the lowest of these, and is found, of varying thickness, resting upon the original (*i.e.*, pre-glacial) rock-surface, accommodating itself to it in a manner unknown among sedimentary deposits. Thus in the broad and deep pre-glacial valley of the Ouseburn the boulder clay not only lines the bottom of the valley, but also covers the sides and even caps the topmost ridges. In character it does not differ materially from the type so often described as occurring elsewhere. It is a stiff blue clay in which are embedded grooved and polished boulders of all sizes; the larger ones are chiefly of local origin, sandstone, limestone, and whinstone (basalt and dolerite) predominating; the smaller boulders comprise in addition to these ironstone, shale, claystone (very frequently with cone-in-cone structure), and occasionally coarse granite. The smaller boulders are often well rounded, and appear to have been transported part of their journey at least by the agency of running water. Porphyritic rocks, and others far-travelled, are comparatively scarce, a feature which distinguishes the till of this region from that of the neighbouring Tyne Valley, and possibly also from that nearer the coast.

The *Prismatic Clay*, when its base is visible, generally rests upon the boulder clay, and differs from it in being less plastic and relatively free from boulders, and in having apparently a larger proportion of far-travelled rocks amongst these than the boulder clay. On drying it shrinks into prismatic forms, from which peculiarity it derives its name. The mode of origin of this clay is uncertain; its formation has been ascribed to the action of the sea upon the boulder clay proper, and it is quite possible that in some places this in the case. An alternative hypothesis will be given later.

The *Later Gravels*.—These are fairly extensively distributed in the country under the 400-foot contour, and include kaims and other pebbly deposits, all of which are alike in one

THE EACHWICK KAIMS.

The wavy outline of the large kaim is due to ploughing. Between this kaim and the one in the foreground (from which the picture is taken) can be seen part of a peat bog enclosed by these kaims.

(Photographed by Mr. F. G. Trobridge).

DEWLEY HILL.

A round gravelly hillock resting on boulder-clay at the side of the Dewley Burn and the head of the Ouseburn. It is probably a kaim.

respect, namely, that they have been produced near the end of the Glacial Period.

The kaims are well developed about Kirkley and Eachwick, and form long sinuous ridges and hummocks of gravel and pebbles, resting apparently upon a level platform of boulder clay, and rising in places to a height of about 40 feet. Those near Kirkley form especially well-marked features, stretching from Bonas Hill southwards through Kirkley, the Obelisk Hill, East Thorn and West Thorn, and thence westwards through the Beacon to Higham Dykes; two parallel ridges run some distance north from East Thorn and West Thorn respectively. Between Eachwick Hall and the Med Burn near South Dissington is another fine series of kaims, trending in the main south-east, and resembling the Kirkley kaims in all respects. In one place they enclose a peat-bog—a characteristic of kaims in those parts where they are best developed. Dewley Hill, an isolated mound of gravel and pebbles, about 20 feet high, with a circular base, may be classed as a kaim, though there may be some slight doubt on the matter as will be seen shortly.

The composition of these kaims is similar in many respects, though slight differences do exist; they are made up of sand, gravel, and well-rounded pebbles of all sizes up to a foot across, and they show in places a certain amount of cementing. The pebbles in the Kirkley kaims are chiefly of sandstone: limestone, and in less measure whinstone, are fairly abundant, and there is a good proportion of foreign rocks, including coarse pink and grey granite, porphyrites, felsitic rocks, amygdaloidal lava and greenstones. The Eachwick kaims are distinguished by the relatively large amount of limestone and whinstone in the pebbles, and by the clayey, less sandy, nature of the finer material; foreign rocks, except greenstones, seem less plentiful than in the Kirkley deposits. Dewley Hill resembles in composition the Kirkley kaims, with the difference that limestone and whinstone are comparatively scarce; granite and porphyritic rocks are fairly plentiful. The

finding of small flints on the surface,* many of which exhibit human workmanship, might be thought to confirm the common view that the pile is of human origin, but its size and position, the nature of its pebbles and the general resemblance to the other kaims, make this extremely improbable. It is quite likely that such a prominent feature might be used by primitive man for burial or other purposes, which would sufficiently account for the presence on it of relics of his handiwork.

Of the other deposits included in the Later Gravels, one occurs near Edington at the edge of a deep, almost dry, valley, which breaches the watershed between the Wansbeck and the Blyth. It forms a bed about 3 feet thick, traceable for about 30 yards horizontally at a height of some 30 feet above the bottom of the valley. It was obviously formed by the large stream which cut the valley; and since, as we shall see later, this stream had only a short-lived existence at the end of the Ice Age, the deposit must date from that time. In composition it is a mixture of gravel and well-rounded pebbles up to 4 inches in diameter, consisting chiefly of sandstone, with a fair admixture of whinstone and quartz and some granite and porphyrites. These materials are clearly derived from the rocky ridge and its drift cover through which the valley cuts, but although whinstone appears to preponderate in the neighbouring drift, yet limestone is by no means absent, so that the great scarcity of this rock (so far as my observations go) in the pebble bed is remarkable.

Near to Middle Duddo is a pebbly deposit resting on boulder clay and exposed by the cutting of the Duddo Burn. The pebbles in it are well rounded in part, though many are sub-angular; they seldom exceed 2 inches in size, and are embedded in a mixture of sand and clay. In composition they resemble

* As showing the abundance of these, I may state that collecting one day with two friends, we picked up over four dozen flint chips ("wasters" and a few "scrapers") in less than an hour. In this connexion passing mention might be made of a large chert spear-head, which I had the good fortune to find near Callerton, a few miles from Dewley Hill. This chert is of especial interest in that it seems to be undoubtedly of Purbeck origin. None of the Dewley Hill flints are in any way like it. For description see Univ. Dur. Phil. Soc., vol. iii., no. 1.

those of the Edington bed. A somewhat similar deposit occurs at the same height (200 feet) near the Shilvington Burn about $1\frac{1}{2}$ miles away, though in both cases the development is poor.

Passing mention may be made here of a small pebble bed which is exposed in the bed of the Ouseburn a little below West Brunton. It is covered with about 6 feet of prismatic clay, and is remarkable in so far as it abounds in roots, now partly converted into peaty matter, which do not penetrate the clay above. Though its base is not seen, there is a great thickness of drift in this place, and the bed must rest upon this. In character and position it resembles the beds of peat, lying beneath brick earth, which have been observed at Shields and near Redheugh.*

Erratic Blocks.—These are strewn broadcast over the surface of the land, and have been largely drawn upon for the construction of stone dykes and houses. They consist almost invariably of whinstone, sandstone, and limestone, and both in number and size increase enormously towards the west of the district, that is near to their presumable source of origin, the Great Whin Sill and the outcrops of Bernician Limestone.

The *Glacial Sands* seem, from the evidence of borings and sinkings, to occur at all horizons in the drift. On the surface they cover extensive tracts in the valleys of the Ouseburn and the Pont and Blyth. Near to Gosforth they form hillocks, elliptical in shape, with the major axes running roughly east and west, *i.e.*, parallel to the Ouseburn. Such hillocks are to be seen at Brunton Low Plantation, Bent Hill, Fencer Hill, and about Gosforth Lake. In the flats about the Pont and Blyth they are quite smoothed out. There can be little doubt that some of these deposits of surface sand have been produced by denudation acting since glacial times, since they occasionally occur near the bottoms of valleys which have

* Lebour, "Handbook to the Geology and Natural History of Northumberland and Durham," p. 13.

been in part scooped out since the ice passed away. Others possibly date from the time of the glacial lakes, as will be shown later. Those which are intercalated with the clay have naturally been formed during the Ice Age itself.

The Pre-glacial Surface.—The general contour of the country before the oncoming of the ice can be made out from field observation by mapping the height of the rock exposed, and this is supplemented where the drift is thick by information derived from borings and sinkings. This method has been admirably applied to the case of the "Wash" by Wood and Boyd*, and more recently to the Northumberland and Durham Coalfield by Woolacott.†

Viewing the district under consideration broadly, we may say that above the 400-foot contour the surface of the land, and consequently the drainage system, was much the same in pre-glacial times as it is now, with the difference that the valleys were deeper and the country as a whole had more character. Below that level, however, many of the old features have been obliterated by the accumulation of drift, and at times this has resulted in the setting-up of a new drainage system.

The main facts deducible about the old land-surface are these:—Much of the country in the west of the area was then, as now, of a gently undulating character, sloping gradually eastwards from the watershed and supplying the head-waters of a number of burns which flowed down the dip-slope of the rocks. Only one of these burns attained to any size and cut deeply into the land; this was the pre-glacial "Blyth,"‡ the modern representative of which, flowing in much the same direction, is still the most important stream of the district.

Coming now to the country below the 400-foot contour,§ there were several long unbreached ridges which formed the

* Trans. North of Eng. Inst. Min. Eng., vol. xiii., p. 69 (1863–4).

† Op. cit.

‡ In future the inverted commas used with such names will refer only to the *pre-glacial* streams.

§ That is present level. It should be remembered that the country as a whole stood much higher in pre-glacial times than it does now.

water-partings between neighbouring drainage systems. One is traceable through Bolam, Whalton, Saltwick, and Bellasis to Catraw, and evidently parted the "Wansbeck" waters from those of the "Blyth"; another, coinciding in general direction with the strike of the rocks, passes through Harlow Hill, Heddon Laws, Callerton, Dinnington, Brenkley, Blagdon, Shotton, High Ewart, and Bedlington, and formed the main watershed between the "Blyth" and "Tyne." These two ridges I propose to call, for ease in reference, the Whalton Ridge and the Dinnington Ridge respectively. A spur of the Dinnington Ridge passes through Throckley, Whorlton, Newbiggin, and Kenton to Coxlodge. This may be called the Kenton Ridge.

Berwick Hill, which appears now as a short spur of the Dinnington Ridge, was quite isolated in pre-glacial times from that ridge by the deep valley of the "Pont."

Around the north, west, and south sides of Berwick Hill is a stretch of flat, drift-covered country about 10 square miles in extent. Borings in this district have disclosed the fact that a similar expanse of flat land existed there in pre-glacial days. This is evident from the data in the following table :—

Name of Place.	Thickness of Drift in Feet.	Height of Rock-Surface in Feet.
Ogle	127	156
Milburn Lodge	119	181
West Coldcoats	122	150
Middle Coldcoats ...	119	100
Smallburn	117	80
Ponteland Village ...	112 (+)	88 (-)
Ponteland Lane House ...	106 (+)	94 (-)
Carr House	131	95
New Horton Grange ...	120	84
North Carter Moor ...	117	56
Kirkley Mill	97	77
Thorneyford	117	75

The plus sign (+) indicates that the boring was stopped before rock was proved; the minus sign (–) corresponding thus refers to the maximum height of the rock surface possible in that place.

The gradients here are quite inappreciable, and although the information is not such as to warrant any extensive deductions concerning the pre-glacial land-surface, yet it may safely be affirmed that there was a large tract of flat land here at the meeting-place of numerous smaller burns with the two main arteries, the "Blyth" and the "Pont."

The Pre-glacial Streams.—The Upper Blyth and the How Burn now flow in drift-filled valleys which are superimposed in great measure upon pre-glacial valleys. The former stream in its course from its source to Blagdon, a distance of about 14 miles, only once (near Trewick) forsakes the drift to cut into the rocky southern bank of the pre-glacial valley. The pre-glacial "Blyth" thus flowed, in the main, in the direction of the present river, and some indication of the extent to which the old valley has been filled up by glacial deposits is given by the data supplied by borings and sinkings along its course. Thus near Brandywell Hall the thickness of drift is 72 feet and the rock-surface 508 feet above sea-level; half a mile east of this the drift is 63 feet thick and the rock-surface at 462 feet, and at Bradford, a mile further east, the values are 89 and 396 feet respectively. Still lower down, at Carter Moor, the drift reaches the great thickness of 117 feet and the rock-surface is only 56 feet above sea-level.

Of the smaller burns, the Belsay Burn and the Ogle Burn do not appear as the representatives of any pre-glacial streams; their courses have been determined entirely by the land-surface and the exigencies of drainage existing at the close of the Glacial Period, without any reference to the contour of the pre-glacial surface. The same applies naturally to those small streams, as *e.g.* the March Burn, Swallow Sike, and the Small Burn, which run entirely over superficial deposits. The Blackheddon Burn in the first four or five miles of its course seems to flow in the drift-filled valley of some pre-existing stream; it touches rock last near Robsheugh at 400 feet, and from there to its meeting with the Pont flows over an enormous thickness of drift, 119 feet being registered at Milburn, 122 at West Coldcoats, and 119 at Middle Coldcoats.

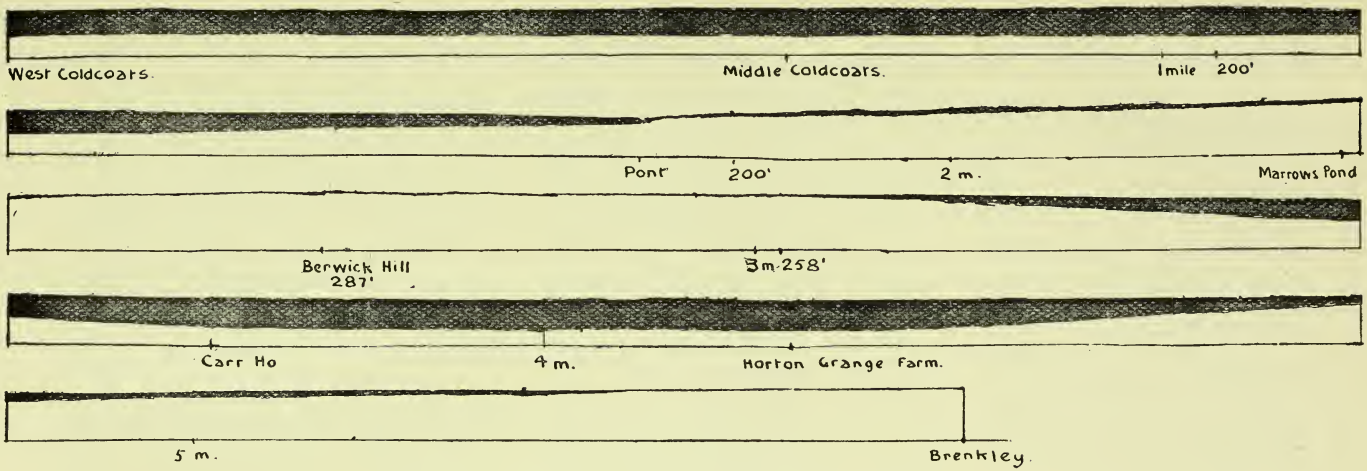


Fig. 1.—*Section from West Coldcoats to Brenkley.*

Showing the distribution of drift (marked black) and the form of the pre-glacial land surface along the line of section. The valley of the pre-glacial Pont between Berwick Hill and Brenkley is clearly marked.

The horizontal and vertical scales are the same, viz., 6 inches=1 mile. The places named are those where the height of the rock-surface and the depth of the drift are ascertainable. The strips should be traced and placed together lengthwise, the right side of each being placed in contact with the left side of the strip immediately beneath it.

The evidence in the case of the Pont is incomplete as to its upper reaches. From Stamfordham to Dissington its course has been cut since glacial times almost entirely through solid rock. Below that, however, a well-marked pre-glacial valley can be traced, which passes through Ponteland, Prestwick Carr, and Horton Grange. Thus considerable diversion of drainage has taken place in these parts owing to the accumulation of drift material during the Ice Age, for the pre-glacial "Pont" flowed along the *east* side of Berwick Hill, by the site of what is now actually a water-parting between the Pont and the Blyth.

The pre-glacial streams, the "Pont" and the "Blyth," meeting near Blagdon, seem to have taken a northerly direction, parallel to the Dinnington Ridge, by what is now Stannington, and to have found an outlet by way of Hepscott into the "Sleekburn."* Detailed mapping of the rock-surface in this part of the country renders this reading of the events extremely probable, since the possible outlet for the waters of the "Blyth" is narrowed down to the tract of land stretching one mile north-west of Stannington Bridge, and it is here that thick deposits of drift are exposed in the gorge cut by the Catraw Burn. Stannington Vale, through which the modern Blyth finds its way to the sea, is entirely of post-glacial origin.

The case of the Ouseburn is similar to that of the Blyth. For the first five miles of its course it flows in a drift-filled valley somewhat south of the pre-glacial stream; near West Gosforth the two courses cross, the pre-glacial one trending in the direction of the North Road and Jesmond, while the present stream flows somewhat east of this through Jesmond Dene (a valley of post-glacial age) and discharges into the Tyne near the mouth of the pre-glacial valley.† The pre-glacial stream seems to have received near Gosforth an im-

* The course of this pre-glacial river has been described by Woolacott. Op. cit., p. 83.

† The lower portion of the "Ouseburn" has already been traced by Woolacott. See "The Geological History of the Tyne, Wear, and Associated Streams," Univ. Dur. Phil. Soc., vol. ii., p. 121.

portant tributary, which, rising at Killingworth, flowed much in the direction of the Willow Dene Burn. Some data derived from borings and sinkings which enable one to follow the course of the "Ouseburn" may now be quoted; though somewhat fragmentary in character they suffice, along with others in the same district and with field observation, to fix the course of the pre-glacial stream with considerable probability.

Name of Place.	Thickness of Drift in Feet.	Height of Rock-Surface in Feet.
Callerton Colliery	143	137
Low Luddick	144	166
Woolsington	99	101
Grange (or Waterworks) Farm	118	62
West Gosforth	126	74
Coxlodge Hall	128	90
Jesmond (near Heaton Haugh)	72	-12

The last figure (-12) is depth of the rock-surface below sea-level.

It is not without interest to note that the three valleys (namely, that of the "Blyth" north of Blagdon, of the "Pont" east of Berwick Hill, and that of the "Ouseburn" from West Gosforth southwards) which have been so completely choked with drift in glacial times as to give rise afterwards to a radically different drainage system, all trend in the general direction from south to north or *vice-versa*, that is at a high angle to what must be regarded as the main direction of ice-movement during the greater part of the Glacial Period. On the other hand, those portions of the pre-glacial valleys which have approximated in direction to that of ice-movement, seem not to have been completely obliterated by accumulations of drift materials.

IV.—Forsaken Water Courses.

The recognition of these as, in many cases, the result of glacial action, is chiefly owing to the researches of Kendall* and Dwerryhouse,† who studied systems of deserted channels

* "On a System of Glacier-Lakes in the Cleveland Hills," Quart. Jour. Geol. Soc., vol. lviii., p. 503 (1902).

† "The Glaciation of Teesdale, Weardale, and the Tyne Valley and their Tributary Valleys," Quart. Jour. Geol. Soc., vol. lviii., p. 572 (1902).

similar to those about to be described, and referred their formation to ice agency at the close of the Glacial Period.

These old water-courses are in the nature of long, clean-cut valleys or slacks with parallel banks and well-defined windings. Sometimes they cut through rock, at other times through drift, or occasionally partly through both. Where the banks are rocky, they are steepest on the convex sides of the windings. The bottoms are flat and of uniform slope, and covered with a rank growth or peat. The slacks are often quite dry; sometimes they contain a small burn, sike, or letch, which bears no just proportion to the depth of the slack or the size of the windings; they generally cut the watersheds between large adjacent valleys. There can be no manner of doubt that they are the deserted channels of short-lived, fair-sized streams, and the survival of a coarse pebble-bed in one of them completely confirms this view.

In the district under discussion seven of these slacks have been discovered and investigated. The Whalton Ridge is breached near Edington by one of them, which I shall call the Shilvington Slack. It takes in at 345 feet, and is traceable as a strong feature as far almost as Broad Law, a distance of 1½ miles, where it mouths at 260 feet. A small stream, the Shilvington Burn, enters it near its head; the slack is cut through rock, slightly capped in places with drift, and is of especial interest in that it is, apparently, the only one connecting the valleys of the Wansbeck and Blyth; and furthermore it bears on one of its banks the coarse pebble-bed mentioned above, as witness to the stream which produced it.

The lofty watershed between the Tyne and the Pont and Blyth (the Dinnington Ridge) is breached by four slacks in "parallel sequence"; these may be referred to as the Heddon, the Callerton, the Luddick, and the Woolsington Slacks, naming them in order from west to east. The first and most westerly is a deep gorge cutting chiefly through rock between East and West Heddon. The Dewley Burn enters it near its head, but is there a quite insignificant stream.

The other three slacks are dry, or at most contain a small "letch" in their lower parts, which carries away local drainage. The first has its head at High Callerton, and cuts mainly through rock as far as Black Callerton. The second takes-in at Hold House and mouths at Low Luddick; the third is roughly parallel to this at about half-a-mile distance, and ends near the Wheat Sheaf Inn at Woolsington. The Ponteland road runs for some little distance along this slack. The last two seem to be cut almost entirely through drift.

The survey of these slacks has yielded the following data*:—

Name of Slack.	Height of Intake in Feet.	Height of Mouth in Feet.	Approximate Depth near Intake in Feet.
Heddon... ...	400	380	80
Callerton ...	340	280	55
Luddick ..	298	266	40
Woolsington ...	268	250	26

Closely resembling these (differing in fact only in position) is a slack resembling a broad moat, which isolates Darras Hall from the Dinnington Ridge, and is roughly parallel to it at some little distance from the top of it. The valley is obviously independent of the Callerton Slack, for its outlet, though near the intake of the latter, is at 325 feet, and there are no indications of any direct connexion between the two. We may call this the Darras Slack; its mode of formation is clearly referable to the same causes which produced the others.

Just east of Newbiggin (near Westerhope), a short spur of the Kenton Ridge which passes through Newbiggin and Kenton Bank Top is breached by a deep cutting known as Newbiggin Dene. This has all the characteristics of the other slacks. It takes in at 300 feet, ceases to be a feature at 250 feet near Kenton Bank Foot; it is cut through rock, is

* I am greatly beholden to Dr. F. C. Garrett for the accurate survey of the Callerton, Luddick, Woolsington, and Darras Slacks; the figures for the Heddon Slack are approximations only.

quite dry (the Newbiggin Burn rises at its foot), and differs in fact from the other slacks only in the northern slope of its thalweg.

It should be mentioned that careful examination of the country in the area treated of has failed to disclose any more valleys similar to those just described, though it is possible that others are yet to be found. Two doubtful cases there are, namely, on the Shafthoe Crags and near Wideopen, but as the evidence is incomplete, it has been thought better not to include them in this account.

The phenomenon of these forsaken water-courses is by no means restricted to this part of Northumberland; they occur, for example, near Alnmouth, and on Alnwick Moor, but they attain their greatest development in and around the Cheviot Hills. It is there they were noticed twenty years ago by Clough,* and later by Gunn and Clough,† who refer to them in the following words :—

"At many places we meet with dry steep-sided little valleys or denes crossing over watersheds. There is nothing to suggest that they are along lines of weakness or outcrops of soft beds, and it has been suggested that they may have been formed by streams from glaciers." And again : "Every here and there we are surprised by finding dry denes—deep-sided valleys—crossing watersheds. They may possibly, in some cases, coincide with the outcrop of veins or other soft beds, but no such coincidences have been proved. Is it possible that they were caused by glacial streams?"

The careful examination of over twenty of these dry denes has convinced me that they differ in no essentials from those occurring in the country between the Tyne and the Wansbeck; they are generally deeper and longer in accordance with the bigger features of the country, and their courses are often complicated by branching, loop-like channels, the effect of

* Mem. of Geol. Survey, "The Geology of the Cheviot Hills," p. 48 (1888).

† Mem. of Geol. Survey, "The Geology of Part of Northumberland, including the Country between Wooler and Coldstream," p. 4 (1895).

THE HEDDON SLACK.

Showing its gorge-like character and large windings, and, in the foreground, the flat slack-bottom covered with bents and rank growth.

THE CALLERTON SLACK.

View of the intake of the slack taken from the north, showing how the watershed is breached by it. The slack winds round to the left in front of the plantation.

which is to isolate rounded hummocks of rock, encircled by what on lower ground would be oxbows.*

According to Kendall's hypothesis these slacks or swires (*see* footnote) may be regarded as the forsaken channels of streams which had a temporary existence during the last stages of the Glacial Period, such streams being the overflow-waters of lakes formed by the impounding of drainage in valleys by ice-sheets which still lingered on the lower ground.

To apply this hypothesis to the case in question we must assume that at one stage in the passing of the great ice-sheet with which the country was clad in glacial times, the high land above, say, the 400-foot contour was relatively free from ice, while the lower land east of this was still buried under an ice-sheet, which moved in a general southerly direction, the western edge of this sheet stretching in a line roughly from Heddon Laws to Bolam. This would serve as a barrier to the escape of the waters of all the eastwardly flowing burns in the Pont-Blyth area, and would produce a lake bounded on the north by the Whalton Ridge, on the east by the ice-sheet, on the south by the Dinnington Ridge, and on the west by the high land above the 400-foot contour. This lake (which may be called the Pont Lake), overflowing at the lowest point, between East and West Heddon, would cause the Heddon Slack to be cut.

The next stage in the passing of the ice of which we have evidence seems to have coincided with the retreat of the ice-sheet a little eastwards, along with the temporary clearing of the Dinnington Ridge, the edge of the ice resting on the north side of the Ridge, and allowing the waters of the lake to

* In Northumberland and the Northern Counties generally, the smaller valleys are called cleughs, denes, hopes, slacks, nicks, gashes, and swires, the choice of name depending partly upon the position and character of the valley, and partly upon local usage. Slack is the generic name for any surface-depression whether caused by running water or not, and is thus a convenient word to apply to valleys of the kind described above. Swire—a word surviving in place-names, but otherwise obsolete—might well be used as a distinctive name for valleys having the characteristics of the above "slacks" or "dry denes." Its use was first suggested by Lebour (Geol. Mag., vol. 6, p. 443), and more recently by Woolacott (Geol. Jour., July, 1907).

escape between the Ridge and the ice. Such an arrangement as this must be hypothecated to account for the Darras Slack. The water, after emerging from this slack, possibly flowed away over the ice itself, for it has left no certain records of its subsequent course.

A slight movement of the ice over the Dinnington Ridge, together with a general recession eastwards, now caused the Pont Lake to drain away by Callerton, cutting the slack of that name, and a further retreat brought about the erosion of the Luddick Slack by the overflow waters.

The next recession of the ice-sheet is interesting in so far as it probably resulted in bringing the waters of the Wansbeck into the Tyne. Of the conditions of the Wansbeck valley up to this, with respect to land and ice distribution, we have little or no evidence, but at this stage, apparently, our ice-sheet stretched across the valley, damming up the waters therein, and the resulting lake overflowed across the Whalton Ridge by Edington into the Pont Lake. The Shilvington Slack, which was cut in this way, ceases to make any feature at about 260 feet, which possibly marks the level of the Pont Lake at this period; and as the Woolsington Slack takes-in at about the same height, it may be inferred that it was the overflow channel of the lake when the latter was fed by water from the Wansbeck, flowing in through the Shilvington Slack.

To the same period may be ascribed the formation of Newbiggin Dene, which mouths at the same height (250 feet) as the Woolsington Slack. It would appear that the ice-sheet resting on the Kenton Ridge had caused a small lake to be formed between it and its spur, which lake, overflowing at the lowest point, caused the slack at Newbiggin to be cut.

The final mode of escape of the waters which breached the Dinnington Ridge is by no means clear, though it seems likely that they reached the Tyne valley by way of Dewley, where the watershed is low. It seems probable that the eastern ice-sheet completely blocked the Ouseburn valley during one portion of this period, and that the Pont waters

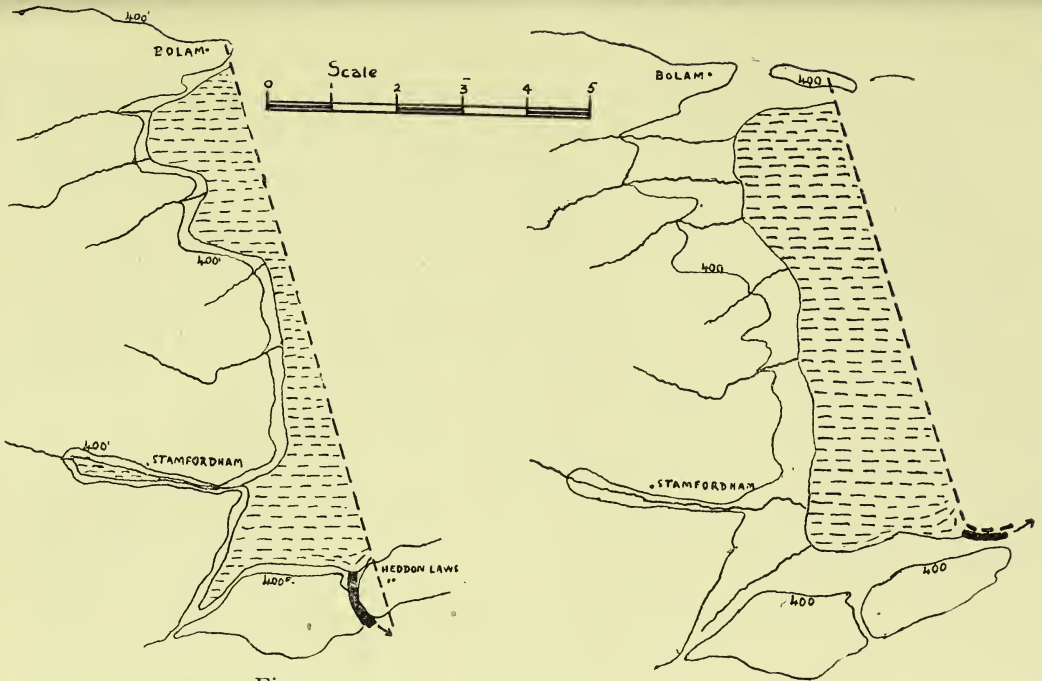


Fig. 2. Fig. 3.

Plans to show various stages in the existence of the Glacial Lakes.

The thick broken line to the right indicates the probable position of the western edge of the ice-sheet. The lakes are shaded, and their overflows marked with thick black lines, the arrows giving the direction of flow. The figures refer to contours.

Fig. 2 shows the first stage, the Pont Lake draining through Heddon Slack.

Fig. 3 shows the second stage, corresponding to the overflow through Darras Slack.

escaped in part over the surface of this. The ascertainable facts and legitimate assumptions bearing on the question are :—(1) that the lowest portion of the watershed between the Tyne and upper Ouseburn valleys probably did not exceed 280 feet in height; (2) that the sudden stoppage of the lower ends of the swires points to the streams which flowed through them having entered a lake; (3) that the upper Ouseburn was flooded during part of the time that the Pont Lake was in being, and that successive levels of this Ouseburn Lake were 280, 266, and 250 feet, which are the respective heights of the mouths of the Callerton, Luddick, and the Woolsington and Newbiggin swires. In the absence then of trustworthy evidence I would suggest that the waters of the Pont Lake reached the Tyne valley by way of Dewley, flowing over the ice in the Ouseburn valley during the period of existence of the overflow stream at Heddon, and breaching the watershed (when this had become free from ice) during the time when the direct overflow was through the Callerton, Luddick, and Woolsington Slacks.

The assumption we have made of temporary ice-dammed lakes in the valleys of the Wansbeck, the Pont and Blyth, and the Ouseburn, whilst it gives a clear and simple explanation of the phenomena of the swires, renders it likely that other evidence of their existence will remain in the shape of strand-lines, beach-deposits, etc. Such evidence is, however, not with certainty forthcoming, a fact which may be explained by the almost complete absence of sections in the likely places, the extensive cultivation of the land, and the short term of life of these glacial lakes. Exception may perhaps be made of the pebbly deposits near Middle Duddo, described in the chapter on the "Drift," though even here the evidence is far from satisfactory.

It seems probable, however, that the smoothing out of the drift in the lower lands, and the formation of surface sands, which occur on all the sites of these hypothetical lakes, date from this period, and that many smaller lakes or loughs were

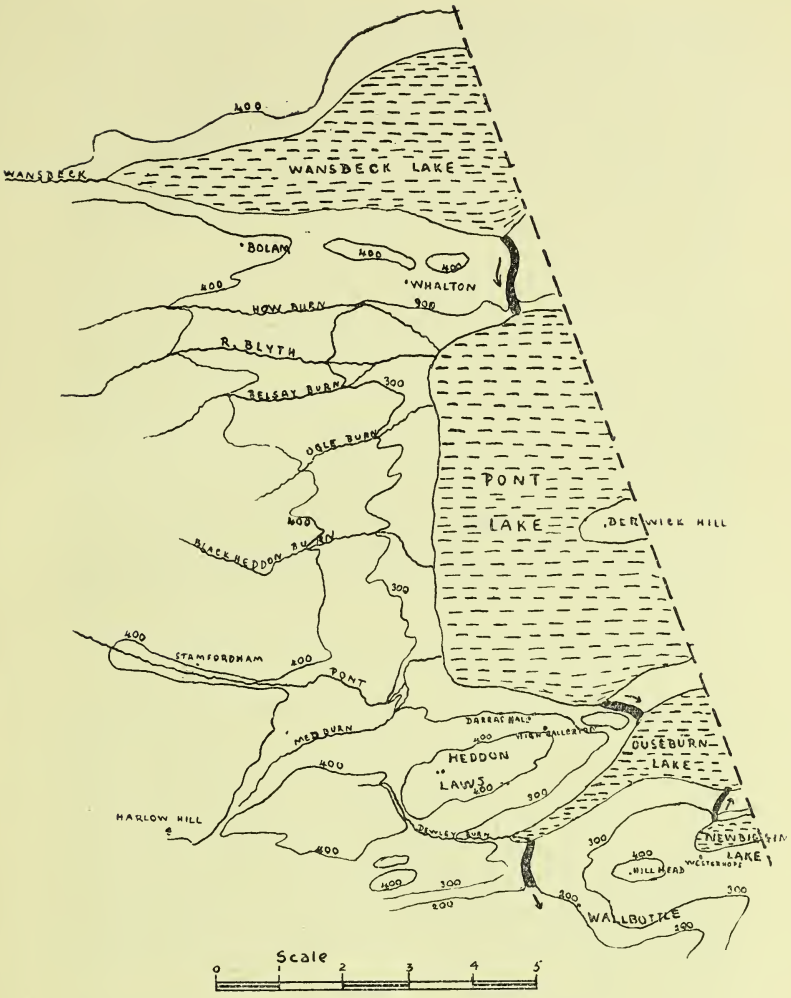


Fig. 4.

Plans to show various stages in the existence of the Glacial Lakes (continued).

Shading and other signs as in Figs. 2 and 3.

Fig. 4 shows the last stage—the Wansbeck Lake overflowing into the Pont Lake through Shilvington Slack, the Pont Lake and the Newbiggin Lake into the Ouseburn Lake through Woolsington Slack and Newbiggin Dene, and the Ouseburn Lake into the Tyne through Wallbottle Dene.

left when the ice finally passed away. Some of these, as for example near Middleton* in the Wansbeck valley, and between Fenwick and Stamfordham in the Pont valley, probably existed until comparatively recent times, and Prestwick Carr† was only completely drained about 50 years ago. There can be little reasonable doubt that these lakes were the puny representatives of the large ice-dammed lakes existing at the close of the Glacial Period.

Though the explanation given above may be admitted in the case of the "dry" slacks, objection may be made to it when the slack contains a burn, even though only a small one, so that it is important to have some criterion to enable one to distinguish the "swires" (in the sense of forsaken channels of streams derived from ice-dammed lakes) from ordinary valleys. Apart then from the obvious disproportion between the size of the burn and its windings and those of the swires, the one unmistakeable feature of the swires is the constant parallelism of their banks; in other words they have been cut by streams derived from without, which have not been sensibly augmented in volume during their passage through the swires.

As bearing on the same subject, it may be remarked that the position of overflow of a glacially-dammed lake would be where the containing watershed was lowest, and as in many cases the lowering would have been brought about by the cutting back of some stream, it is not surprising that these temporary glacial streams frequently followed the path of the head waters of a normal stream, and that on the cessation of the glacial stream the normal one should again flow along its wonted course.

* Lebour, "Handbook to the Geology and Natural History of Northumberland and Durham," p. 14 (1886).

† In an old (scientifically worthless) account of the Carr, reference is made to the discovery of "seven feet of marl overlain by three feet of a peaty nature. The marl contained shells of helix and turbo [*i.e.*, Planorbis and Paludina] and quantities of bog-moss, and stems and leaves of aquatic plants near the upper part of the stratum. At the bottom the shells were incrusted hard together." See "An Historical and Descriptive Account of Prestwick Carr and its Environs," by D. Maddison. 1830.

A possible objection to the view sketched above of the mode of origin of the swires in this district is that none exists at a lower level than the Woolsington one (250 feet), and that if the ice retreated as uniformly as it apparently did between Heddon and Woolsington, then the Kenton Ridge should have been breached by a stream from the temporarily flooded Ouseburn Valley. It is quite possible that such a thing did happen, and that Jesmond Dene was initiated in this way, and became the permanent outlet for the drainage of that valley; indeed such a view would simplify the explanation of many peculiarities of this basin-like depression. East of this, although the running of the Kenton Ridge is taken up by one passing through Longbenton and Backworth, yet the ridges to the north die out, and thus little opportunity is afforded for the formation of lakes dammed by an easterly ice-sheet. Any evidence which might have borne on the point in the coastal regions has probably been obliterated during the depression of land which followed upon the close of the Glacial Period.

The History of the Dewley Burn and the Ouseburn.

There are some peculiarities connecting these two burns which call for notice here, inasmuch as they are, in part at least, explicable in terms of the hypothesis of ice action developed above. The Dewley Burn rises near Heddon Steads, flows east and enters the Heddon Slack near its head. This it traverses in a southerly direction, turning east near Heddon Mill, and entering the broad drift-filled valley which belongs topographically to the Ouseburn. Turning sharply south at Dewley Hill, it forsakes this valley, and cutting the deep gorge of Walbottle Dene, enters the Tyne at Newburn. A short distance east of Dewley Hill the Ouseburn rises, there being no high land between the two burns. The subsequent course of the Ouseburn has already been traced.

I would suggest in explanation of these peculiarities that the "Ouseburn" in pre-glacial times rose near Heddon Mill, and flowed east by north in the way already indicated; the Dewley Burn had then no representative, for the gaps of

Heddon Slack and Walbottle Dene are of late glacial age. During the period of maximum glaciation the "Ouseburn" Valley was partly filled with drift, and near the end of the Ice Age the temporary lake in the Pont Valley, overflowing by Heddon, caused the slack of that name to be cut. It seems likely that the Ouseburn Valley was still choked with ice at this period, for the waters issuing from the Heddon Slack, at an elevation much above that of the watershed near Dewley, have left no traces of their subsequent course. The recession of the ice-sheet in the Pont Valley corresponded to its withdrawal from the Ouseburn Valley, and it seems not improbable that while the Pont Lake was draining through Darras Slack the kaim of Dewley Hill was being formed at the edge of this ice-sheet. When the level of the Pont Lake had fallen to that of the Callerton overflow, the Upper Ouseburn Valley was free from ice, and the waters entering it through Callerton Slack, somewhat augmented by those of the Dewley Burn which had now come into existence, being dammed by the eastern ice-sheet formed a lake, which overflowing near Dewley initiated the erosion of Walbottle Dene. This Ouseburn Lake apparently sank in level by the cutting-down of its outflowing waters from a maximum of about 280 feet to 266 feet when the Pont Lake drained into it through Luddick Slack, and finally to 250 feet when it was fed by the Pont Lake through the Woolsington Slack, and by the Newbiggin Lake through Newbiggin Dene.

With the further recession of the ice-sheet the Ouseburn Lake drained away naturally eastwards, the channel of Walbottle Dene became the permanent outlet for the Dewley Burn, and the Ouseburn, shorn of its true head-waters by their diversion through Walbottle Dene, took its rise on the swampy lake-bottom (locally and aptly called "The Bogs") just east of the head of this Dene.

Summary and Deductions.

Assuming that the main hypothetical statements made in the foregoing account are justifiable, we are now in the

position to survey, in a more detailed manner than has hitherto been possible, the past history of this tract of country from the times immediately preceding the Great Ice Age to the present.

Before the coming of the ice the surface of the land was graven by a number of streams which flowed roughly down the dip-slope of the rocks. Of these the chief were the "Pont" and the "Blyth," which, uniting west of Blagdon, were turned northwards along the escarpment of the Coal Measures and entered the "Sleekburn" somewhere near Hepscott; and the "Ouseburn" which, rising near Heddon Mill, followed a course very similar to that of its modern representative.

During the Glacial Period the land was covered with an enormous ice-sheet which moved on the whole towards the east and south-east, bringing with it a vast quantity of loose talus matter and mud, and which on melting deposited its burden irregularly over the land, in some cases completely blocking the valleys of the ancient streams. Before the passing of the ice completely, the high land west of the 400-feet contour became relatively free from ice, while the country east of this was held by a sheet which moved in a general southerly direction. The new streams developed on the higher land were barred by this ice-sheet, extensive lakes were thus formed which overflowed across the natural watersheds, and as the sheet gradually retreated the level of the lakes fell, with the result that fresh notches at progressively lower levels were cut by their outflowing waters. When finally the ice disappeared, these overflow channels were left high and dry, and the normal streams accommodating themselves to the now-altered contour, were forced to carve new passages, often forsaking the courses of the pre-glacial valleys and cutting through what were lofty watersheds in pre-glacial times. Thus the Blyth has cut the gorge of Stannington Vale, and the Ouseburn that of Jesmond Dene, since the ice passed away; and on the other hand three deep pre-glacial valleys running respectively north through Stannington, north through Horton

Grange, and south through Gosforth, remain now completely choked with drift matter, the existence of which would be unsuspected but for the careful consideration of the distribution of drift and rock in the surrounding country, and for the evidence revealed in the deep borings and sinkings which have been made for water and coal.

During the first period of glaciation the main movement of ice was undoubtedly from the west and north-west, and the preponderating number of quite local rocks, along with the scarcity of far-travelled rocks which seems to distinguish the till of this region from that of the Tyne Valley, points to the fact that the high land between them was not greatly overridden by ice from further west and south. Some mixing evidently did take place on a small scale, as is evident from the occurrence of boulders of granite in the till. Towards the east of the area the typical porphyrites of the Cheviots increase in number, especially in the less stony clays above the boulder clay proper, from which it would appear that with the progress of glaciation the ice had more a northerly origin, particularly that portion of it which traversed the lower-lying lands.

Professor Lebour has pointed out to me that the ice at its first oncoming would transport most of the loose talus material to lower levels, but that later sheets, having little to act upon but the smooth high-lying stretches of rock, would carry chiefly finely ground matter, which on the melting of the ice would be left behind as a fine mud. Such a view would enable one to understand the formation of the less stony clays, the origin of which has been ascribed to the action of the sea upon the boulder clay proper during the depression of the land which followed upon the Ice Age. This latter explanation, though quite feasible, not to say probable, in the case of the flat lands bordering the coast,* is obviously inapplicable to the greater part of the country at present under examination.

* As for example the Boldon Flats. See Woolacott in the paper cited above, "Superficial Deposits, etc.," p. 66.

The assumption we have made of the eastern ice-sheet at the close of the Glacial Period, when the high land to the west was in a large measure free from ice, is possibly connected with the question concerning the origin of the upper drift gravels. Three points bearing upon this matter may be noticed: (1) to account for the swires a southerly component to the motion of this ice-sheet must be assumed; (2) that the later gravels as mapped by the Geological Survey* are restricted to the country under the 400-foot contour (a fact confirmed by my own observations); and (3) that notwithstanding some differences in composition, the kaims are alike in containing, among pebbles of local origin, many porphyritic and felsitic rocks apparently of Cheviot origin, and ashes, lavas, and granites similar to those occurring in the eastern parts of Scotland. Taking these facts into account, it would appear that this eastern ice-sheet moved south along the flat coastal regions of Northumberland from Scotland to the Tyne, bringing with it rocks from these northern parts, which were deposited in the form of kaims at or near the edge of this ice-sheet when it formed the barrier of the Pont and Ouseburn lakes. Such a sheet, sweeping around the flanks of the relatively ice-free Cheviots, would afford a good explanation of many of the swires which, as stated above, form such a prominent feature of that region.

Some points regarding the formation of a parallel sequence of swires, such as exists on the Dinnington Ridge, may be touched upon here. There is no need to assume anything more than a gradual and continual retreat of the ice to account for such a sequence. The duration of overflow of an ice-dammed lake at any point across its containing watershed will depend upon the ratio between the rate of rock-erosion at that point and the rate of ice-retreat along the watershed, and the cutting of a lower notch by the lake-waters will only take place when the watershed becomes clear of ice at a level *just below* that of the existing channel at the position where it

* It may be mentioned here that no distinction is drawn on the Survey Drift Maps between what we have called Later Gravels and Surface Sands.

leaves the lake. A little consideration shows that in the case of a parallel sequence of swires a simple numerical relationship should exist between the depths of the swires and the heights of their intakes; this relationship is: the height of the intake of a swire *plus* the depth of the swire near that point,* equals the height of intake of the next swire higher in the series.

This is illustrated by the following section which is drawn (only roughly to scale) along the Dinnington Ridge from West Heddon to Prestwick Pit Houses near Woolsington, that is in a line running E.N.E. along the water parting of the ridge.

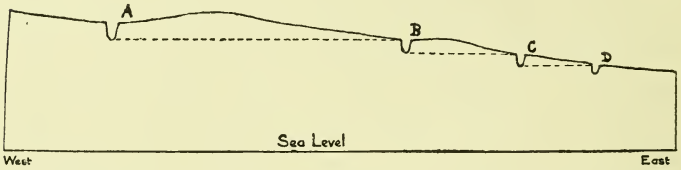


Fig. 5.—*Section along the Dinnington Ridge from West Heddon to Woolsington* (left to right in diagram).

The ground slopes in the main from west to east, and the ice-sheet, retreating in the same direction, has allowed the Pont Lake to drain across the ridge, cutting channels at consecutively lower levels. The first channel (on the left in the section) was cut while the ice retreated from A to a position B, at which the ridge was uncovered at a level just below that of the bottom of the first notch. Similarly during the retreat of the ice from B to C, and C to D, the second and third notches respectively were cut, the abandonment of any channel by the outflowing lake-waters only occurring when an outlet at a lower level was afforded. By comparison of the levels as indicated by the dotted lines, it will be readily seen that the numerical rule given above holds good.

* That is at the original water parting. It may be noted that with the progressive deepening of a swire the intake becomes displaced towards the lake side of the ridge. This point has to be borne in mind when estimating the depth of a swire.

Applying this rule to the sequence on the Dinnington Ridge we get :—

Name of Swire.	Height of Intake in Feet. (A)	Depth of Swire in Feet. (B)	Sum of A. & B.	Name and Height (in feet) of Intake of Next Higher Swire.
Woolsington ...	268	26	294	Luddick, 298.
Luddick ...	298	40	338	Callerton, 340.
Callerton ...	340	55	395	Heddon, 400.

These considerations only hold, naturally, when the recession of the ice-dam is so slow that the lake is always full to overflowing, and it may be noted as another consequence of them that the ice-dammed lake becomes lowered in level gradually, not *per saltum*; the close agreement between the corresponding figures in the last two columns of the table above would seem to prove that the eastern ice-sheet retreated quite regularly from Heddon to Woolsington, a distance of four miles.*

The data connecting the intakes and outlets of the swires enable us, further, to estimate the relative rates of lowering of the Pont and Ouseburn Lakes. We have seen reason to think (p. 102) that the Ouseburn Lake sank in level 30 feet during the period of complete erosion of the Luddick and Woolsington Slacks; for its level was 280 feet when the Callerton Slack had just been cut, and 250 feet when the Woolsington Slack had just ceased to carry off the Pont Lake waters. During the same time the level of the Pont Lake must have sunk from 340 feet to 268 feet (the intakes of the Callerton and

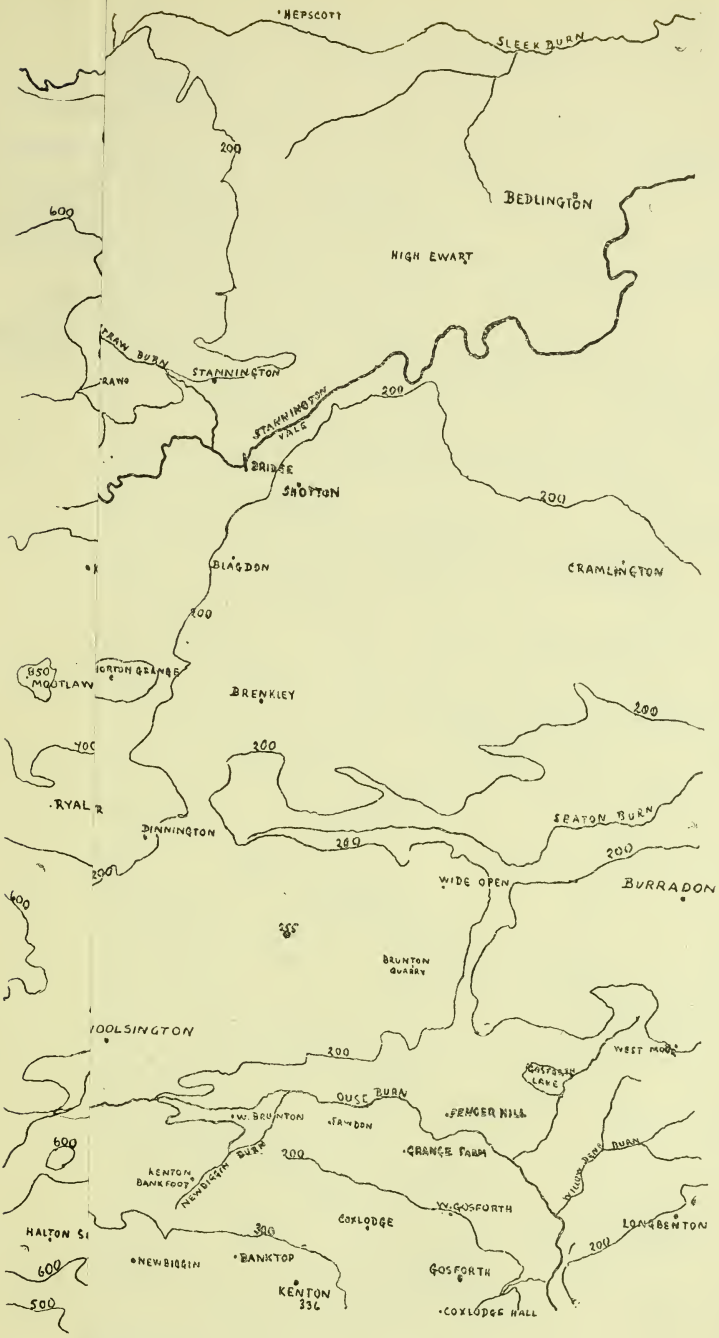
* Since the above was written an excellent paper on "The Glaciation of East Lothian south of the Garleton Hills" (Trans. Roy. Soc. Edin., vol. xlvi., pt. 1, no. 1) by Kendall and Bailey has appeared, from which it is evident that the authors have come to the same conclusions as myself concerning what one might term the mechanism of ice-retreat and swire-formation, though the data quoted in the paper are used to confirm their view of an ice-sheet retreating, not uniformly, but with occasional advances. It is a great satisfaction for me to find my deductions from Kendall's hypothesis confirmed by the originator of the hypothesis and his collaborator.

Woolsington Slacks respectively) that is 72 feet. The difference is striking, and is doubtless partly due to the nature of the materials through which the overflow channels were cut, this material being compact rock in the former case, and mainly soft drift deposits in the latter.

We have thus seen that there is considerable evidence for the view, that at the close of the Glacial Period the lower-lying land was held by an ice-sheet which travelled past the Cheviots from Scotland, and it may be permissible here to refer to a pebble bed, which, although outside of the area under particular consideration, may yet bear upon the general question of the glaciation of eastern Northumberland. This pebble bed occurs at Horsebridge Head on the coast just north of the Wansbeck; it rests on Coal Measures sandstone, and is overlain by typical boulder clay. It contains a certain amount of brecciated sandstone, but is composed chiefly of well rounded sandstone pebbles, with a few sandy beds and patches of clay. Its foreign contents are of particular interest, and many years collecting has furnished samples of a great variety of rocks, all of which may have come from the Cheviots and Scotland. Such an assemblage of far-travelled rocks is most probably ice-borne, and occurring, as they do, beneath the boulder clay, may have been brought by an ice-sheet moving southwards over the coastal regions before glacial conditions had extended over the whole county.

It may be, then, that the Glacial Age was ushered in by a set of conditions similar to those which existed at the end of that period, and that this pebble bed with its seal of clay is the only relic of that early stage of glaciation, all other evidences having been obliterated by the onward march of the main ice-sheet.

In conclusion, it is a pleasant duty to acknowledge the help I have received from various sources. I am grateful to the owners of several estates, to Viscount Ridley of Blagdon, C. L. Bell, Esq., of Woolsington, Brodie Cochrane, Esq,, of South Gosforth, and the High Gosforth Park Co. (through


HEPSCOTT
SLEEK BURN
200
BEDLINGTON
600
HIGH EWART
TRAW BURN
STANNINGTON
STANNINGTON VALE
200
BRIDGE
SHOTTON
200
BLAGDON
CRAMLINGTON
200
850
MOOTLAW
BRENKLEY
200
200
RYAL
DINNINGTON
SEATON BURN
200
200
WIDE OPEN
BURRADON
600
BRUNTON QUARRY
OOLSINGTON
200
WEST MOOR
GOSFORTH LAKE
OUSE BURN
W. BRUNTON
FAWDON
PENGER HILL
600
GRANGE FARM
200
KENTON BANKFOOT
NEWBIGGIN BURN
W. GOSFORTH
COXLODGE
LONGBENTON
HALTON S
300
200
NEWBIGGIN
BANKTOP
600
GOSFORTH
KENTON 336
500
COXLODGE HALL

Vansbeck.

Fig. 6.—*Contoured map of part of the country between the Tyne and the Wansbeck.*

The figures refer to heights above sea-level. Scale—1 inch=⅔ mile (about).

T. H. Hitch, Esq.), for leave readily granted of access to their grounds; and to my colleague, Dr. Woolacott, for the loan of several maps of the eastern part of the area, in which he has carefully recorded the results of borings and sinkings, and also for his verification in the field of many of my observations.

I am especially indebted to Professor Lebour for his constant interest in the work, and for much valuable criticism which he has been ever ready to bestow upon it.

Allendale Spiders

By the Rev. J. E. Hull, M.A.

(Received Feb. 16, 1908)

These notes cover a year's spider-collecting in Allendale, mainly in the basin of the West Allen. East Allendale has not been touched, nor any locality below 700 feet or over 1,600 feet.

I have found the open fells singularly unproductive, but this was no doubt largely due to the unfavourable season. The scattered patches of woodland have given by far the best results, especially such as have an undergrowth of heather and thick moss. The mouths of abandoned lead mines have yielded one or two interesting captures, and also the "dead-heaps" which adjoin them. These latter are composed of blocks of limestone, among which live a few species which are more or less troglodytes in their manner of life.

Up to the present time the number of species taken is exactly 160, a very respectable total for a confined upland area. Of these one is a *Hilaira* new to science, and three others—*Tmeticus rivalis*, *Tigellinus furcillatus*, and *Meta menardi*—are new to the Northumbrian list, though the last-named has also been found in Kepier woods near Durham. Equally noteworthy with these is the re-discovery of *Leptyphantes angulatus*, Cb., first found by Dr. James Hardy on the Cheviots near Wooler in 1871. One male was then taken, and has remained unique until now when I have had the good fortune to turn up both males and females (the latter sex new to science).

I append brief notes of the more notable captures.

Onesinda minutissima (Cb.). Adult females among moss in woods; once only among heather in the open.

Tapinopa longidens var. **unicolor**, Cb. A single female from near Wooler was sent by Dr. Hardy to Mr. Pickard-Cambridge in 1871, and described by him as a

distinct species. Later he has recorded it as merely a variety of *T. longidens*, which it undoubtedly is. Two or three examples have turned up in woods—all females.

Leptyphantes angulatus (Cb.). Wooler, 1871, Dr. Hardy. An adult male turned up in December, 1906, and is in the hands of Mr. Pickard-Cambridge. Another was taken in September, 1907, and lately I have found a spot on Whitfield Fell where both sexes occur freely. The female being new to science, figures and description are now given.

Porrhomma egeria, Sim. An inhabitant of the "dead-heaps," but very rare.

Hilaira pervicax, sp. n. A single adult male among moss in a wood at about 1,400 feet. Females were fairly plentiful. Description and figures below.

Tmeticus firmus, Cb. This recent addition to science occurs pretty frequently among moss and heather, also in the "dead-heaps."

Tmeticus rivalis, Cb. Another recently discovered species, more abundant here than the preceding. Both sexes occur throughout the autumn and winter up to 1,500 feet.

Sintula fausta, Cb. Occasional in damp places in the woods; males only.

Lophocarenum Mengii, Sim. Pretty plentiful in the pinewood on Whitfield Fell; males in spring; females all the year round.

Diplocephalus Beckii (Cb.). One or two examples of each sex.

Metopobactrus prominulus (Cb.). A single male; among grass.

Tapinocyba pallens (Cb.). Among fallen pine-needles in the winter.

Tapinocyba præcox (Cb.). Scattered examples among grass on the open hill sides.

Wideria antica (Wid.). Under stones by the river; also among heather on the fells. Not uncommon, whereas *W. cucullata*, Koch, occurred only once, which is contrary to Dr. Jackson's experience at Hexham.

Prosopotheca monoceros (Wid.). Females only; among heather at 1,400 feet.

Tigellinus furcillatus (Menge). A female, near Staward; Mr. Falconer.

Meta menardi (Latr.). In the old lead mines and "dead-heaps"; also in the cellar at Ninebanks Vicarage.

Cyclosa conica (Pallas). Staward Peel; Mr. Falconer.

Descriptions of the new spiders here follow. *Leptyphantes angulatus* being as yet peculiar to Northumberland, I have included a description and figures of the male for the sake of completeness.

Hilaira pervicax, sp. n.

Plate V., figs. 1–4.

Male:

Cephalothorax 1·5 mm. long, dark brown, smooth, and shining. Frons depressed at the upper line of eyes, backed by an occipital eminence nearly the height of the clypeus. From the summit of this the backward slope of the thorax is practically straight. A few short stiff hairs on the dorsal line.

Eyes.—Breadth of the ocular area ·5 mm. (the whole width of the caput). The two lines of eyes are very slightly bowed outwards in the middle. Front middle eyes small, a diameter and a half apart, twice that distance from the laterals. Upper eyes about equal in size; the middle interval slightly the least.

Clypeus a little deeper than the central eye space, hardly convex (seen from above).

Falces double the length of clypeus, finely corrugate on the outside.

Legs yellowish, robust; two dorsal spines on the tibia; those on the hind legs stronger and darker coloured than the rest. Tarsus of the fore legs equal in length to the metatarsus; tarsus of the hind legs two-thirds of the length of the metatarsus. Order of the legs in point of length—4, 1, 2, 3.

Palpus of the same colour as the legs, but tarsus and tibia very dark brown; femur curved, widest at the forward extremity; patella short, as wide as long; tibia about the same length, but produced above into a stout blunt process gently curving over the base of the tarsus. Tarsal bulb dark coloured, not very complex in structure; paracymbium inconspicuous. The strong terminal spine of *excisa* is represented by a spatulate process of a rich vinous brown colour directed backwards along the under side of the bulb and reaching the middle.

Abdomen olive green, thickly clothed with long whitish hairs.

Female:

Cephalothorax 1·9 mm. long. No depression of the frons, the occiput being very high but its curve unbroken. Eyes as in the male.

Falces much thicker at the base than in the male.

Abdomen large, broad, and rather flattened; colour and clothing as in the male.

Epigyne a large yellowish plate, tranversely wrinkled in the middle; vulva showing as two dark oval depressions set obliquely, converging backwards and reaching the hinder margin, where they are separated by a space equal to their lesser diameter.

Among moss in a pinewood on Whitfield Fell at about 1,400 feet, February, 1908. One male; females plentiful.

This species is a little larger than its two congeners. The male can be readily distinguished by the conformation of the

occipital region, and by the palpal tibia which is nearly black and of characteristic form.

Leptyphantes angulatus, Cb.

Plate V., figs. 5–9.

Male :

Total length 2·2 mm. Legs 4, 1, 2, 3.

Cephalothorax clear yellow or pink, usually with a distinct black border, but this is sometimes obsolete. Dorsal profile indented slightly about the middle.

Eyes on black spots. Upper line nearly straight, eyes subequal, equidistant. Front middle eyes on a little transverse ridge which overhangs the clypeus and is wrinkled behind; smallest of all, a semi-diameter apart. Lateral eyes on a strong tubercle, the front ones distant from the centrals about one diameter of the latter.

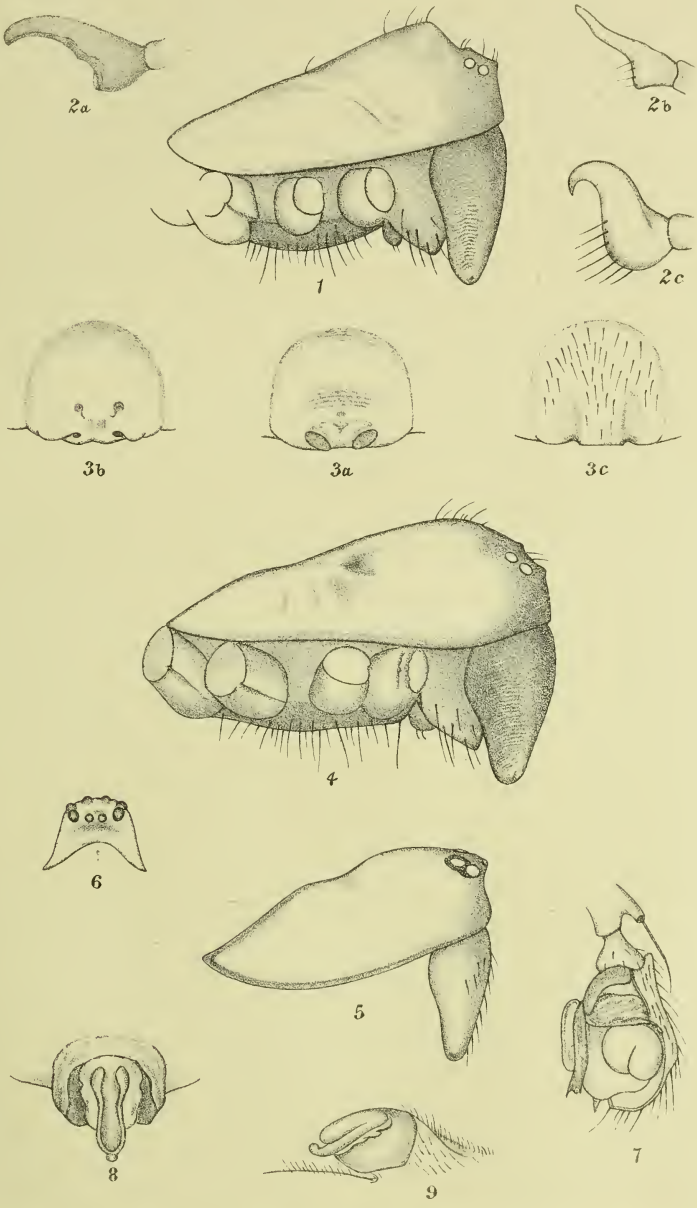
Clypeus equal in depth to the ocular area, concave above, convex below; basal line arched.

Sternum normal, dark.

Falces about twice the length of the clypeus, with longish scattered hairs in front.

Legs pretty long, yellowish, with tibia, metatarsus, and tarsus of 1 and 2 clouded with black. Femur 1 with a single spine. All tibiæ with two dorsal spines. Tibia 1 with a spine on each side near the apex; tibia 2 with a similar spine on the posterior side only. All the metatarsi with a single dorsal spine near the base. Metatarsus and tibia of the fourth pair equal in length.

Palpus with tarsus just longer than tibia and patella combined, with a conical protuberance at the base of the inner side. Tibia normal, small. Patella with a conical process above bearing a strong curved black bristle. Tarsal bulb with a strong short spine at the extremity; paracymbium large; on the under side a long strap-shaped process, forked at the end.



J. E. Hull, del.

W. West, lith.

ALLENDALE SPIDERS.

Female :

Total length 2·3 mm. Legs 1, 4, 2, 3, but very little difference between 1 and 4.

Abdomen dull green, with pale transverse bars visible after immersion in spirits. In this and in its general coloration it resembles the male, but all the metatarsi and tarsi are clouded with black.

Epigyne characteristic, with a large central process deeply grooved in the middle longitudinally.

Among moss and heather in a pinewood on Whitfield Fell at about 1,400 feet.

This species resembles *L. Whymperii*, F. Cb., in structure, but is much smaller. It is also nearly allied to some Continental species, but readily distinguished by the form of the patellar process of the palpus, by the details of the palpal bulb and of the basal protuberance of the tarsus.

REFERENCES TO PLATE V.

1. *Hilaira pervicax*, male, cephalothorax.
2. Tibiæ of the male palpus :
   - a *Hilaira pervicax.*
   - b *H. excisa.*
   - c *H. uncata.*
3. Epigyne of the three species of *Hilaira* :
   - a *H. pervicax.*
   - b *H. excisa.*
   - c *H. uncata.*
4. *Hilaira pervicax*, female, cephalothorax.
5. *Leptyphantes angulatus*, male, cephalothorax.
6. ,, ,, frons of male.
7. ,, ,, male palpus, outer side.
8. ,, ,, epigyne of female.
9. ,, ,, same, lateral view.

CATALOGUE OF BUTTERFLIES COLLECTED IN BURMAH

By Lt.-Col. C. H. E. Adamson, C.I.E.,

up to the end of 1895, and presented by him to the Museum of the Natural History Society of Northumberland, Durham, and Newcastle-upon-Tyne

Part II.

REMARKS

In publishing the second part of this Catalogue, of which the first part was published in vol. i. (1905) of these Transactions, I wish to make the following remarks.

I had intended to follow the arrangement of Mr. Moore in the Papilionidæ, but his regrettable illness and subsequent death before he had entirely completed the sub-family Pierinæ caused considerable delay in completing this family.

With regard to the Lycænidæ I have generally followed the arrangement of Mr. de Nicéville in his "Butterflies of India, Burmah, and Ceylon"; but when dealing with the Amblypodia group I have followed Mr. Bethune-Baker in his paper on this group published in the *Trans. Zool. Soc. Lond.*, vol. xvii., 1902. I have also divided the family into sub-families as proposed by Mr. Doherty (*Jour. Asiatic Soc. Bengal*, vol. lv., 1886).

The Hesperiidæ I have arranged according to Elwes and Edwards' revision of this family published in vol. xiv. *Trans. Zool. Soc. Lond.*, 1896.

I cannot conclude without expressing my sincere regret at the loss sustained by all entomologists in the death of Mr. Moore before he had concluded his great and exhaustive work on the Rhopalocera of India.

C. H. E. ADAMSON.

CATALOGUE—PART II.

PAPILIONIDÆ (CONTINUED), LYCÆNIDÆ, AND HESPERIIDÆ

FAM. PAPILIONIDÆ

SUB-FAM. PIERINÆ

254. DANAUS AJAKA, Moore.

I have one specimen taken in November in the Chin Hills at 3,000 feet elevation.

255. D. CANIDIA, Sparrm.

Common throughout the cold weather about Bhamo, and among the hills on the Upper Chindwin River.

256. DELIAS ITHIELA, Butler.

I have one specimen of this insect taken in the Chin Hills in October, 1893. It is almost black, and shews no trace of yellow on the upper side. I doubt the distinctness of this species from *D. belladonna*, which also occurs in the hills of Burmah.

257. D. AGLAIA, Linnæus.

Common throughout Burmah, especially in November.

258. D. THYSBE, Cramer.

Two males and two females. The former taken in November and the latter in March. Bhamo and Upper Tenasserim.

259. PICCARDIA HIERTE, Hübner.

Common throughout Burmah.

260. P. AGOSTINA, Hewitson.

I have caught only three specimens, in April, October, and December respectively; two in Arracan and one on the Upper Chindwin.

261. P. AGORANIS, Grose Smith.

The type specimen, now in my collection, was caught by me at Tounggya Sekkan, Tenasserim, April, 1880. There are a male and a female also from Burmah in the British Museum.

262. P. DESCOMBESI, Boisduval.

Very common from March till December. On one occasion I came across this insect in great profusion at its breeding place at the beginning of May in a forest near Kaukareet on the Yonzaleen River. I found larvæ, pupæ and imagines, the latter in the act of laying eggs, at the same time in the same place.

263. PRIONERIS THESTYLIS, Doubleday.

Three specimens of the wet season form were taken by me in March and April on the Lampha Choung, near Taoo; and two specimens considerably smaller, and with fewer dark markings, were taken in February at Tounggya Sekkan, also in Tenasserim. These are the dry season form which was described by Hewitson under the name of *Watsoni*.

264. P. CLEMANTHE, Doubleday.

Male taken in Moulmain and Tenasserin districts, but not commonly, in February and March. I have not taken a female.

265. APPIAS HIPPOIDES, Moore.

Both males and females are exceedingly common. There are two distinct forms of females which, however, are connected by intermediate forms. In one form the under side of the hind-wing of the female is similar to that of the male; while in the extreme of the other form it is dusky-white, gradually darkening towards the posterior margin and with all the nervules fuscous. In a large series the gradations of the two forms can be clearly traced, and they are probably seasonal or climatic.

266. A. ZELMIRA, Cramer.

I have a very large series of this species, both males and females. The form *Zelmira* appears in the rainy season and changes imperceptibly, as the cold and dry seasons follow each other, into the form formerly known as *A. irvinii*. In my series of many males and females, although I have extreme forms of each variety, yet, it is quite impossible to divide the two when a large number are seen together. I

have also taken undoubted males of *Zelmira in coitû* with both varieties of females. The insect is common in Central Burmah from October till April, but some specimens may be seen in the middle of the rains. It is not so common in Lower Burmah. The illustrations on plate 544 (figs. 1, 1a, and 1h) of Moore's "Lepidoptera Indica" are taken from specimens caught by me.

267. HUPHINA COPIA, Wallace.

I have a large series of these insects taken throughout Burmah. The seasonal forms vary in a similar manner to those of *Appias zelmira*. This is one of the commonest insects in Central Burmah.

268. H. LEA, Doubleday.

I have caught this insect commonly near Rangoon, but it appears to be a southern species, as I did not find it at all in Upper Burmah.

269. H. NADINA, Lucas.

I have this insect from Bhamo and Upper Tenasserim. It varies much in size and in the tone of colouring on the underwings.

270. HYPOSCRITIA LALAGE, Doubleday.

I have caught this insect not uncommonly in Upper Burmah in October and November, but only a single specimen in Lower Burmah. The upper side varies in colour from shining white to a rich cream colour. The black markings also vary considerably in intensity.

271. H. LAGELA, Moore.

This is probably a local variety of *H. lalage*, Doubleday. I took a single male in Upper Tenasserim in March, 1881, in which the brown markings on the under side of *H. lalage* are replaced by bright yellow. Illustrations plate 548, figs. 2, 2a, in Moore's "Lepidoptera Indica," are taken from the specimen in my collection.

272. H. INDRA, Moore.

Males taken abundantly in the Arracan Hill tracts in April, also in Tenasserim in December. It has a habit of flying

about the tops of trees, whence it descends to imbibe moisture from the damp, sandy beds of streams. I have only taken males.

273. Lade lalassis, Grose Smith.

Numerous males of this insect were caught by me at Tounggya Sekkan on the 24th April. From one of these the type was described.

274. Catophaga adamsoni, Moore.

Males of this insect were taken commonly by me on the Arracan Hills in April, 1893, and less commonly in Tenasserim in February. The females in my collection which have been so named by Mr. Moore can hardly be separated from the females of *C. darada*; and I am not sure to which species they should be assigned. Figs. 2d and 2e, plate 551, in Moore's "Lepidoptera Indica," are taken from a male in my collection.

275. C. darada, Felder.

Numerous males taken in November in the Arracan Hills and in Tenasserim. One very damaged female was taken *in coitû*, and this is the only specimen I have caught. Perhaps some of the females under the head of *C. adamsoni* should belong to this species.

276. Tachyris galba, Wallace.

I have only taken one specimen, a male, of this insect in the Chin Hills in the extreme north of the Chindwin district. It was the type of Grose-Smith's *Appias nebo*, and the specimen in my collection is figured on plate 558, figs. 2c and 2d, of Moore's "Lepidoptera Indica."

277. Leptosia xiphia, Fabricius.

Very common in shady places throughout Burmah.

278. Dercas doubledayi, Moore.

This is a rare butterfly in Burmah. I have only seen one specimen, which I captured in April at Tounggya Sekkan in Upper Tenasserim.

279. Gandica burmana, Moore.

Not uncommon in the north and west of Upper Burmah,

but rare in Lower Burmah, where I have only taken very few specimens in November and December. I think hardly separable from *G. harina*, Horsfield.

280. NIRMULA LÆTA, Boisduval.

Not uncommon about Bhamo. Scarce in Lower Burmah.

281. N. RAMA, Moore.

In my collection are three males taken by me in Pokoko in the central or dry zone in Upper Burmah in the month of February, when it was not uncommon.

282. TERIAS HECABE, Linnæus.

Terias is an excessively common genus in Burmah, but I am only able to recognize two species of the genus in the country, which I distinguish by the names of *T. hecabe* and *T. davidsoni* (= *T. silhetana?*), and which have been shown by the breeding experiments of Messrs. Davidson and Aitkin to be distinct. The former species has two, and the latter species three spots in the cell of the underside of the fore-wing. In the damp evergreen forests of Burmah there is no doubt a tendency for the black marginal band of the hind-wing to broaden, and in extreme cases to become diffused over the whole extent of the wings. In some specimens in my collection the whole of the upper surfaces of the fore-wings and hind-wings are covered with a powdering of brownish black specks. *T. hecabe*, as recognized by me, is an excessively common insect at all seasons of the year. The wet and dry season forms both appear to fly throughout the year.

283. T. DAVIDSONI, Moore.

I am not sure whether this insect should not remain under the name of *T. silhetana*, Davidson and Aitken. I have in my collection only two males and one female; but as when collecting I did not discriminate the essential points of difference between this insect and *T. hecabe*, it is probable that I often overlooked it. As one specimen was taken on the coast near Moulmain and one in the dry plains of Upper Burmah near Sagaing, it is probable that the species is broadly distributed.

284. Catopsilia crocale, Cramer.

All Burmah. Common. Sometimes met with in immense quantities after the first shower of rain in April. Females show great variation in size and in the markings of the under side of the hind-wings. Wet and dry season forms are equally common.

285. C. pyranthe, Linnæus.

This is a very common insect throughout the year. For long I was under the impression that there must be two species included under this name; but by comparing a very large number of specimens, both males and females, I find that it is impossible to say to which form some of the specimens belong, and I have been reluctantly led to the conclusion that there is only one very variable species; and though, as a rule, I can at once distinguish between the two forms, yet there are some males and females which I find it impossible to place. Neither do the forms appear to be seasonal, as I have about an equal number of each form caught during the wet and dry seasons. In the form in which both sexes have the smallest amount of dark markings on the upper side, the spots on the disco-cellular nervules of both wings on the under side are generally conspicuous; and the antennæ have a pinkish tinge, which often reappears about the base of the costa. In the other form the dark markings are broader on the upper side; on the under side the mottlings are less conspicuous, and the spots on the disco-cellular nervules are absent, while the antennæ and base of the costa shew no tinge of pink.

286. C. alcyone, Cramer.

One specimen from Mergui.

287. Nepheronia hippia, Fabricius.

Very common about gardens and open spaces in forests throughout the year. Some females are distinctly orange about the base and inner margin of the hind-wings.

288. N. valeria, Cramer.

I have a male and two females which I refer to this species.

They were taken at Tounggya Sekkan in February, 1880. On the upper side of the male the veins are merely indicated by the very finest black lines, and there are no traces of any apical or marginal white spots on the black margin. The insect might be fairly described on the upper side as pale greenish-white with black costal and external margins; and on the under side as pale silvery-white with the veins merely indicated by dark lines. The females have the base of the under-wing conspicuously, and the base of the upper-wing less conspicuously, marked with orange on the upper side. There is no trace of any black streak in the cell of the under-wing. The marginal row of white spots is small. On the under side of the hind-wing the orange markings near the base are conspicuous.

289. HEBOMOIA GLAUCIPPE, Linn.

This insect is widely spread throughout Burmah. I have found it most plentiful on the banks of the Irrawaddy, about a hundred miles above Bhamo. There, in September, I have seen as many as a dozen males together at rest on the moist sand at the edge of the river. I could have caught any number of them. I never saw a female on the river bank, but they were abundant at the time in the neighbouring forest. This insect flies all the year round.

FAM. LYCÆNIDÆ

SUB-FAM. GERYDINÆ, Doherty

290. GERYDUS SYMETHUS, Cramer.

Two specimens, taken in January and March respectively, in the hills in Northern Burmah.

291. G. ANCON, Doherty.

One specimen only, taken near Moulmain in June, 1880.

292. G. BIGGSI, Distant.

Three specimens taken by me in Upper Burmah in March and April.

293. G. BOISDUVALI, Moore.

One male and female, taken *in coitû* at Homalin, on the

Upper Chindwin, in September. Numerous other males and females taken at different parts of Burmah.

294. Parygerydus horsfieldi, Moore.

This is a common species in both Upper and Lower Burmah.

295. Allotinus multistrigatus, de Nicéville.

One female, caught in Tenasserim in June.

296. Logania marmorata, Moore.

Two specimens taken in Bhamo which I think belong to this species, but as it has hitherto only been recorded from Mergui, I am doubtful of its correct identification.

Sub-Fam. PORITINÆ, Doherty

297. Poritia hewitsoni, Moore.

Three males and two females, taken in Bhamo and Tenasserim districts, April till June.

Sub-Fam. LYCÆNINÆ, Doherty

298. Pithecops hylax, Fabricius.

In my collection there are only three specimens taken at Poungbyin in the Upper Chindwin Valley in November, but I believe that I have often mistaken it for *Neopithecops zalmora*, Butler.

299. Neopithecops zalmora, Butler.

I have a very large series of these insects. They are exceedingly abundant near Mandalay and generally throughout Upper Burmah all the year round, and shew great seasonal variation.

300. Neopithecops?

I have some specimens taken at Sagain, Central Burmah, in February, which have a distinct bluish tinge on the white markings of both wings.

301. Spalgis epius, Westwood.

Fairly common in Burmah from September to February.

302. MEGISBA MALAYA, Horsfield.

I have two specimens of this species. One specimen has tails and has merely a trace of white on the disc of the fore-wings. This was taken at Poungbyin in Upper Burmah in July. The other, which has a considerable amount of white on both sides, was taken on the Upper Chindwin in December.

303. CHILADES LAIUS, Cramer.

Very common in the neighbourhood of Mandalay wherever lime trees grow. Both wet season forms and dry season forms abound during their respective seasons.

304. C. TROCHILUS, Freyer.

Very common in Upper Burmah. This insect is in its habits much nearer to *Zizera lysimon*, Hübner, than to *C. laius*, Cramer. It frequents grassy meadows and bare sunny openings in the forests; always keeping close to the ground.

305. CYANIRIS MARGINATA, de Nicéville.

One female near Moulmain in July, and one in Upper Burmah in September.

306. C. PUSPA, Horsfield.

Common at Shwégoo, Upper Burmah, in August. Found occasionally elsewhere.

307. C. JYNTIANA, de Nicéville.

I have taken this insect in the dry weather in Upper Burmah.

308. C. DILECTUS, Moore.

I have four specimens; two taken in the Chin Hills by Capt. E. Y. Walton and two by myself in the Eastern Shan Hills.

309. ZIZERA MAHA, Kollar.

I have specimens of this insect taken in every month of the year in my garden at Sagaing. They shew great diversity in the markings on the under side. Those taken in the middle of the rains have all the spots distinct and black, while those taken in the hot weather have these spots obsolescent, and in some instances obsolete, their situation being indicated

merely by the white rings surrounding the spot. Irrespective of the season the colour of the upper side varies much, and cannot be relied on in determining the species. I have one specimen in which the discal row of spots on the under side are elongated internally parallel to the veins. There was not a day throughout the year when I was not able to find this species in my garden.

310. Z. LYSIMON, Hübner, or KARSANDRA, Moore.

Very common at all seasons in Upper Burmah. Some females are entirely brown on the upper side and some are dusted with violet blue near the base. On the under side this species varies in a similar manner to, though in a less degree than *Z. maha*, Kollar, according to the season.

311. Z. OTIS, Fabricius.

This insect is excessively common all the year round in Upper Burmah, and I have taken it plentifully in every month. It also varies on the under side in a similar manner as *Z. maha*, Kollar, and *Z. lysimon*, Hübner. Sometimes during the dry season the under side assumes a darker grey ground colour and the spots can hardly be traced. The colouring of the upper side in this species appears to be constant except as regards the breadth of the dark margin.

312. Z. GAIKA, Trimen.

This insect in its habits more nearly resembles *Pithecops hylax*, Fabricius, than the three preceding species. It is less common, and appears to be subject to less variation than they are. I have taken it at all seasons of the year near Sagaing. It is most plentiful at the end of the rains.

NOTE.—I do not believe that in Burmah there are more than the four species of *Zizera* I have enumerated above. I have carefully noticed them and caught them day by day in great numbers, and I am convinced that the colouring of the upper wings varies at all seasons of the year. I have also noticed that it is seldom that more than one species is very plentiful at a given spot.

313. AZANUS GAMRA, Lederer.

A very local insect in the Central Zone, though when met with not uncommon. I have caught it in one locality near

Meiktila and two places in the Sagaing district during the hot weather months.

314. Lycænesthes emolus, Godart.

Very common in Central Burmah. The male is generally found on sandy roads and the female among bushes.

315. L. lycænina, Felder.

Central Burmah, but not common. September and October. This species may be very easily overlooked, as until closely examined it cannot be distinguished from *L. emolus*. Its habits are precisely similar.

316. Niphanda cymbia, de Nicéville.

One female taken at Akyab in May. This species has hitherto only been recorded from Sikkim. *N. tessellata*, Moore, its nearest ally, has been described from the Malayan Peninsular, but in that species the female is described as having the base of both wings suffused on the upper side with blue. In my specimen there is no trace of blue on these wings. Mr. Moore had marked my specimen as a new species before *N. cymbia* had been described by de Nicéville.

317. Talicada nyseus, Guérin.

Common in the hot weather on some dry plains in Central Burmah. It is, however, local.

318. Everes argiades, Pallas.

I have taken this insect sparingly in Upper Burmah, but it is not common. It appears to be subject to much variation.

319. E. umbriel, Doherty.

One specimen, taken on the Shan Hills at Singoo, about 2,000 feet elevation, in March.

320. Nacaduba macrophthalma, Felder.

An uncommon species in Burmah. I have only taken three specimens, all in the north of Upper Burmah in September.

321. N. kerriana, Distant.

A single specimen of this well-marked species was taken by me at Natchoung, in Tenasserim, in October.

322. N. DANA, de Nicéville.

I have taken males and females of this species in Upper Burmah. The under side is pale fawn colour. It somewhat resembles Distant's figure of *N. aluta*. One of my males has a tail.

323. N. CŒLESTIS, de Nicéville.

Three males and one female from Upper Burmah.

324. N. ARDATES, Felder.

Common throughout Burmah.

325. JAMIDES BOCHUS, Cramer.

Not common in Lower Burmah, but found abundantly on the beds of rivers in the cold weather in Upper Burmah.

326. LAMPIDES ELPIS, Godart.

Both wet and dry season forms are very common throughout Burmah.

327. L. KONDULANA, Felder.

I have one specimen taken in Moulmain district.

328. L. SUBDITA, Moore.

One female, taken at Tavoy in November, 1893.

329. L. CELENO, Cramer.

This is a very common insect in Burmah. *L. alexis*, Stoll, is undoubtedly the dry season form of this insect; though in December and January both forms may frequently be met with at the same time. This species is commonly known as *C. ælianus*, Fabricius.

330. CATOCHRYSOPS STRABO, Fabricius.

Excessively common in Central Burmah.

331. C. CNEJUS, Fabricius.

Very common in Upper and Central Burmah; not so common in Lower Burmah.

332. C. PANDAVA, Horsfield.

Both wet and dry season forms are common. I have specimens of what I consider to be varieties of the dry season form, which I have sent to Mr. Moore for identification, and

he has returned them with the note "not in the collection Moore." They may belong to an undescribed species, but I think they will turn out to be seasonal varieties.

NOTE.—These three species of Catochrysops are exceedingly common in the cultivated pea fields in Central Burmah. They shew considerable seasonal variations.

333. TARUCUS THEOPHRASTUS, Fabricius.

To be found all the year round in Central Burmah, but most commonly in the cold weather.

334. T. PLINIUS, Fabricius.

Very common in Central Burmah from October till January.

335. CASTALIUS ROSIMON, Fabricius.

Throughout Burmah. Specimens shew great variation in size and colour. The smallest and least strongly-marked specimens come from the dry plains. The darker coloured and larger forms are more common in the evergreen forests.

336. C. ETHION, Doubleday and Hewitson.

Three specimens, taken in April in Tenasserim, and one at Aloungdau Kathapa Pagoda, near the Chindwin River, in February. Rare.

337. C. ROXUS, Godart.

Rangoon, Akyab, and Tenasserim, in October and November.

338. C. ELNA, Hewitson.

I have only taken five specimens of this insect, all in February.

339. C. ROXANA, de Nicéville?

One specimen nearest to *C. roxus*, Godart, was taken by me at Aloungdau Kathapa in January.

340. C. DECIDIA, Hewitson.

Not uncommon in the Bhamo and Upper Chindwin districts. July to November.

341. POLYOMMATUS BŒTICUS, Linnæus.

Very common in Upper Burmah in the cold season, particularly in pea fields on the bed of the river. Rarely seen in Lower Burmah.

Sub-Fam. AMBLYPODINÆ, Doherty

342. Amblypodia anita, Hewitson.

I have a dozen specimens which I have taken in different parts of Burmah. It is never a common insect, and I have usually found single specimens resting on trees and shrubs. They vary much in size and in the markings on the under side. June, July, September, October, and February.

343. A. arracana, Grose Smith.

The type specimen, which is in my collection, was taken on the Arracan Hills in December. Mr. Bethune-Baker, in his paper on the Amblypobia group, published in the *Trans. Zool. Soc. Lond.*, vol. xvii., 1902, has included this species under *A. anita*, Hewitson.

344. Surendra quercetorum, Moore.

In the rains I have found these insects not uncommon both in Upper and Lower Burmah. On one occasion in July, near Hpa An, on the Salween River, I found them most abundant. They were resting on the young shoots of a shrub, and appeared to be imbibing the juice from a sort of *Aphis*. Both males and females were abundant and allowed themselves to be caught without moving.

345. Iraota rochana, Horsfield.

One male, with two tails to the hind-wing, taken at Modoon, near Moulmain, in December. Very rare in Burmah.

346. Mahathala atkinsoni, Hewitson.

Four or five specimens, caught near Kindat on the Upper Chindwin, in July, were named for me by Mr. de Nicéville.

347. M. ameria, Hewitson.

One specimen at Hpapoon, on the Upper Salween, in November, and one at Bhamo in May. Rare.

348. Thaduka multicaudata, Moore.

Two female specimens, taken in July and April at Hpa An, on the Salween River, and at Tounggya Sekkan, in Moulmain district. Rare.

349. Arhopala centaurus, Fabricius.

Common.

350. A. AMATRIX, de Nicéville.

One female, caught at Akyab in May, 1883, and several at Aloungdau Kathapa, in the Chindwin district, in February.

351. A. ANTHELUS, Doubleday and Hewitson.

One specimen sent from Mergui in 1898.

352. A. CAMDEO, Moore.

One specimen, caught at Hpa An, on the Salween River, and one at Yéu, Upper Burmah, both in September.

353. A. EUMOLPHUS, Cramer.

Under this name I class all the green species which I have caught in Burmah. I have one male caught in Moulmain, one in Mandalay, several near Kindat on the Upper Chindwin River, and one at Bhamo. The one caught at Bhamo differs from the others in having the black margin of the fore-wings of even width from the apex to the posterior angle. On the under side it has a very indistinct costal spot. This appears to correspond best with *A. eumolphus*. Of the other males Mr. de Nicéville has named one taken on the Upper Chindwin as "typical *A. hellenore*, Doherty"; and Mr. Moore has named another taken at Mandalay as *A. viridissima*, Swinhoe. I can not make out any difference between them except that the markings on the under side of *A. viridissima* are less distinct and the costal spot is absent. I have two females, taken in July in Upper Chindwin, in company with the males of *A. hellenore*, which undoubtedly belongs to the same species. I have also a female taken in Lower Burmah which Mr. Moore has labelled *A. viridissima?* This is a considerably larger insect than any of the others, and differs principally on the under side in having the second spot on the outer discal band considerably larger than the first and third, as in *A. silhetensis*, Hewitson.

354. A. MOOLAIANA, Moore.

A single specimen, which has been identified by Mr. Moore as a female of this species, was taken by me at Tounggya Sekkan, in Moulmain district, in April.

355. A. SUBFASCIATA, Moore.

One male, taken at Tounggya Sekkan, Moulmain district, in April.

356. A. PERIMUTA, Moore.

One specimen, named by Mr. Moore, taken near Rangoon in 1872, and others also at Rangoon caught by Captain Broughton, R.E.

357. A. ALBOPUNCTATA, Hewitson.

One taken at Tounggya Sekkan in February, and one at Rangoon.

358. A. ASOKA, de Nicéville.

I have one specimen in my collection said to have been taken in North Arracan, but I have never seen the insect there myself.

359. A. TOUNGUVA, Grose Smith.

Not uncommon about Rangoon in cold season.

360. A. AGABA, Hewitson.

One male specimen, taken near Rangoon in April, and one male at Akyab. One female, which was identified for me by Mr. Moore, was taken near Rangoon.

361. ARHOPALA sp.?

One specimen labelled by Mr. Moore as near *A. agaba*, Hewitson.

362. A. RAFFLESII, de Nicéville.

Taken in the cold weather in Upper Burmah.

363. A. HEWITSONI, Bethune Baker.

This insect, as I identify it, was common in the cold season on the lower ranges of hills west of the Chindwin River. It was in company with the preceding species, and though the females can easily be separated, I am in difficulties about the males.

364. A. ATRAX, Hewitson.

I have some females in my possession which Mr. Moore ticketed for me as belonging to this species. I have also males which were taken with the females, and which probably

are of the same species. This insect I have only taken near Kindat, in Upper Burmah, in the wet season.

365. A. ADOREA, de Nicéville.

One male, apparently this species, taken in Rangoon.

366. A. BIRMANA.

Two males and one female, taken near Kindat on the Upper Chindwin. Two in December and one in July.

367. A. ABERRANS, de Nicéville.

Three specimens, Kindat, Upper Chindwin, in July, and one in Lower Burmah on the Salween River.

SUB-FAM. THECLINÆ, Doherty

368. ILERDA EPICLES, Godart.

This butterfly is very common in the Bhamo and Upper Chindwin districts during the rainy season. It is found less commonly in the cold weather.

369. I. ANDROCLES, Doubleday and Hewitson.

I have one specimen taken in the Chin Hills west of the Chindwin River.

370. CAMENA ICETAS, Moore.

I have two specimens, one taken in Lower Burmah and one in Bhamo, which Mr. Moore has identified as belonging to this species.

371. APHNÆUS SYAMA, Horsfield.

Several varieties are very common in Burmah at the same times and places. It is commonest throughout the dry season.

372. A. LOHITA, Horsfield.

I have a large series of these differing much in colour and size. *A. lohita* appears as a rule to frequent higher ground than *A. syama*, Horsfield.

373. A. SCHISTACEA, Moore?

A species taken in Upper Burmah in the dry plains. Small, and with a large orange patch on the upper side of the fore-wing.

374. Tajuria indra, Moore.

One female, so named by Mr. Moore, caught at Mahamuni, near Akyab, in May.

375. T. longinus, Fabricius.

Taken in Akyab and Upper Burmah, but not common.

376. T. mantra, Felder.

One specimen, taken at Martaban on the 7th November, was identified by Mr. Moore.

377. Hysudra hades, de Nicéville.

One female corresponding exactly with de Nicéville's figure in *Pro. A. S. B.*, vol. xvi., part 2 (1897), pl. iv., fig. 29, taken at Tavoy.

378. Tajuria jangala, Horsfield.

Bhamo, Tenasserim, and the Upper Chindwin, but not common.

379. Suasa lisides, Hewitson.

One female, taken near Kaukarit in June.

380. Thamala miniata, Moore.

Males and females were taken by me in some numbers in Moulmain district in April, and I also took a male at Bhamo in June.

381. Hypolycæna erylus, Godart.

Very common.

382. Chliaria merguia, Doherty.

One male from Tavoy in October, 1893.

383. C. othona, Hewitson.

Several males and one female, taken in the north of Upper Burmah.

384. Zeltus etolus, Fabricius.

Common in shady places in Lower and Upper Burmah. It is generally to be found on roads through evergreen forests. Males are much commoner than females.

385. Charana mandarinus, Hewitson.

One male near Bhamo in May, and one female near Akyab in February.

386. NEOMYRINA HYEMALIS, Godman and Salvin.
One specimen taken in Mergui in the dry season.

387. TICHERRA ACTE, Moore.
Upper Burmah, but rare.

388. CHERITRA FREJA, Fabricius, and
„ JAFFRA, Horsfield.
This is a common butterfly in the dry season. I have specimens corresponding exactly with Horsfield's figure.

389. CHERITRA sp.?
I have two specimens, one of which was labelled for me *C. freja?* ♀ by Mr. Moore. The under side of both wings of these two specimens, including the anal angle of the hind-wings, the exterior marginal spot, and the tails, is of a buffish colour. There are no blue markings on the under side of the posteriors, these being replaced by delicate silver grey.

390. HORAGA ONYX, Moore.
I have only taken two specimens; one at Sagaing, Upper Burmah, in February, and one in Lower Burmah.

391. CATAPŒCILMA ELEGANS, Druce.
I have caught this insect in Tenasserim, Bhamo, and the Upper Chindwin districts in the months of February, March, and April.

392. DRUPADIA BOISDUVALI, Moore.
The males are common in many places in June and July. Females are less common.

SUB-FAM. DEUDORIGINÆ

393. YASODA TRIPUNCTATA, Hewitson.
I have several males taken in Bhamo, and also one female agreeing well with the typical insect. I have also one male taken in Bhamo, in which the three black discal spots on the upper side of the fore-wing are absent; and one female, taken in February in Arracan, in which these spots can just be traced. This female is of very small size and pale coloured.

394. Lohura atymnus, Cramer.

Common throughout the year.

395. Curetis bulis, Doubleday and Hewitson.

What I identify as *C. bulis* is the commonest form throughout Burmah. Some specimens approach *C. malayica*, Felder.

396. C. thetis, Drury.

This is the form which is most plentiful in Akyab district in November and December.

397. C. angulata, Moore.

I have one specimen so named by Mr. Moore taken at Bhamo in October.

398. C. saronis, Moore.

Several specimens taken on the Arracan coast.

Note.—The above classification, so far as I am aware, is purely arbitrary, and I think it will turn out that in Burmah at any rate there are, at most, two variable species.

399. Drina donina, Hewitson.

One specimen, caught in Tenasserim in November, and one in Arracan in December. Very rare.

400. Araotes lapithis, Moore.

Three males and one female were taken by me in a pine apple garden near Nyoungbinseip, in the Moulmain district, in December, 1880, and January, 1881. One female was taken at Bhamo in October.

401. Deudorix epijarbas, Moore.

I have only one male in my collection, taken at Tavoy in October.

402. Zinaspa distorta, de Nicéville.

One male from Bhamo, taken in April, one female, Upper Chindwin, in April, and another from Rangoon in May, 1883.

403. Rapala sphinx, Fabricius.

I have three specimens of a *Rapala* with the under side of the wings of an exceedingly rich dark brown, and with the under side of the abdomen of a bright yellow colour, shewing a most marked contrast against the dark brown wings. I believe these to belong to this species.

404. R. TARA, de Nicéville.

One specimen taken at Tounggya Sekkan in May may be this species.

405. R. SCHISTACEA, Moore.

Fairly common in Upper and Central Burmah.

406. R. ORSEIS, Hewitson.

I refer to this species specimens which I have taken in Tavoy. They differ principally from the preceding species in having the band on the under side broader, and bordered on both sides with white; and in having the caudal spot encircled with orange instead of merely crowned with that colour.

407. R. XENOPHON, Fabricius.

Two males taken, one at Bhamo, and the other at Hpapoon on the Yoonzaleen River.

408. R. SUFFUSA, Moore.

One male and several females from the Bhamo district.

409. R. MELAMPUS, Cramer.

I have only a few specimens, taken in Upper Burmah, but it has probably been overlooked by me, as I did not distinguish it from the following species.

410. RAPALA JARBAS, Fabricius.

Common all the year round, both males and females.

411. BINDAHARA PHOCIDES, Fabricius.

One female, caught in Bhamo district at Tsinbo, above the third defile of the Irrawaddy River, in May.

FAM. HESPERIIDÆ

412. ORTHOPHOETUS PHANÆUS, Hewitson.

Moulmain, Rangoon, and Bhamo. One specimen was caught flying about the flowers of *Phlox drummondi* in my garden at sunset in the cold weather.

413. CHARMION FICULNÆA, Hewitson.

One specimen taken at Tounggya Sekkan in Tenasserim in February, 1881.

414. Celænorrhinus leucocera, Kollar.

A common species in Burmah. I have specimens taken in Upper Burmah in February named *C. putra* by Mr. Moore.

415. C. asmara, Butler.

I have specimens taken near Rangoon which I refer to this species. They appear to form a connecting link between *Notocrypta feisthameli* and the *Celænorrhinus* group, but the hind-wing is almost unspotted.

416. C. nigricans, de Nicéville.

One specimen, similar to the above species, but with the distal white band on the upper side continued to the costal margin. It has also a fourth small white spot situated below and contiguous to the discal band, and two additional small white spots below and exterior to the three sub-apical spots. It has been identified for me by Mr. Elwes.

417. C. aurivittata, Moore.

Not uncommon in Tenasserim in March and also in Upper Burmah.

418. C. affinis, Elwes and Edwards.

One specimen taken near Akyab in April, 1881.

419. Sarangesa dasahara, Moore.

A common butterfly throughout Burmah.

420. Coladenia dan, Fabricius.

The dark rufous-brown form is common about Rangoon and other places in Lower Burmah.

421. C. eaith, Kollar.

It is with extreme doubt that I separate this species from the preceding one; but the excessively common form about Mandalay has the ground colour greenish-brown rather than rufous-brown; and the spots on the upper side are whiter than in *C. dan*, Fabricius, where they generally have a yellowish tinge.

422. C. indrani, Moore.

Four specimens caught in Tenasserim in April and one in November. The latter specimen differs from the others in

having the ground colour of both wings pale amber-brown instead of being strongly tinged with orange. It is a rare insect in Burmah.

423. Satarupa bhagava, Moore.

I have five specimens of this species, which vary in the colour of the band on the upper side of the hind-wing from pure white to pale yellow. Captured in December, March, and May. I have also one female so named by Mr. Moore in which the white markings are much enlarged.

424. S. phisara, Moore.

One specimen, taken in Upper Burmah. The yellow band on the hind-wing is very narrow, and the general appearance of the insect is much darker than the preceding species. The insects of this genus generally settle with their wings extended on the flat surface of rocks near water, and are difficult to catch in a net.

425. Odina ortygia, de Nicéville.

One specimen taken at Tounggya Sekkan in February, 1881. I have never seen another in Burmah.

426. Tagiades khasiana, Moore.

Common about Rangoon.

427. T. meetana, Moore.
T. alica, Moore.

I believe these two constitute only one species. The amount of pale colour on the upper side of the hind-wing is subject to variation; and I have some specimens in which the cilia are white throughout and others in which they are tipped with brown. My series consists of about fifteen specimens only, so that I cannot write with confidence on the subject.

428. T. menaka, Moore.

One male, identified by Mr. Moore, was taken by me in Lower Burmah.

429. T. atticus, Fabricius.

Fairly common throughout Burmah.

430. T. PRALAYA, Moore.

One specimen taken in 1881 on the Lampha Choung, in Upper Tenasserim.

431. TAPENA THWAITESI, Moore.

Two specimens, identified by Mr. Moore, were taken by me at Aloungdau Kathapa, in the Chindwin district, in February, 1893.

432. CTENOPTILUM VASAVA, Moore.

One specimen caught at Pagyi, in the Lower Chindwin district, in March.

433. C. MULTIGUTTATA, de Nicéville.

I have five specimens of this insect. Two captured near Myawaddee in the month of February, 1881; and the others in the hilly tracts of Upper Burmah also in February and March. Mr. de Nicéville's description of this species is from a specimen caught by me.

434. ODONTOPTILUM SURA, Moore.

At Rangoon and Bhamo in October. It is common at the former place, but I have seldom met with it elsewhere in Burmah.

435. O. PYGELA, Hewitson.

One specimen, caught in October, 1893, in the Tavoy district. The outer margin of the hind-wing is very deeply indented, much more so than in any Indian Hesperid with which I am acquainted.

436. CAPRONA ALIDA, de Nicéville.

I have four specimens caught on the Upper Chindwin River in January and February.

437. C. SYRICHTHUS, Felder.

Not uncommon in the Bhamo district from May till September. I have nine specimens of this insect, three of which correspond with *C. elwesi*, Watson, five specimens which correspond with *C. syrichthus*, Felder, and one doubtful. The doubtful one is of small size intermediate between the two varieties. The spot at the base of the submedian

interspace on the upper side of its anteriors is not divided into two, though in general appearance it is more like *Elwesi*. Seven of my specimens were taken in Bhamo in the Upper Zone and two were taken at Meiktila in the Central Zone in May.

438. Hesperia galba, Fabricius.

Occurs at intervals throughout Upper Burmah. It is nowhere common.

439. Pamphila dieckmanni, Graeser.

One specimen, captured in the Chin Hills (7,000 feet) in April, was presented to me by Capt. E. Y. Watson.

440. Baracus septentrionum, Wood Mason and de Nicéville.

One specimen taken at Natchoung in Tenasserim in October, 1880, and one in Bhamo district.

441. Astictopterus olivascens, Moore.

Rather scarce in Burmah, but it is an insect which may very easily be passed over unless particularly sought for, as, on the wing, it much resembles *Sancus pulligo*.

442. A. henrici, Holland.

I have two specimens in my collection both taken in April. One in the hills in Moulmain district and one in Upper Burmah.

443. Sancus pulligo, Mabille.

A common species in forests and shady places in Burmah. This species I have particularly noted *often* settles with its wings spread horizontally, though as a rule they are closed over its back.

444. Koruthaialos hector, Watson.

Not uncommon at Tavoy in August and September. I have also found it at Rangoon and Moulmain. Among my specimens is one with a distinct black spot in the centre of the orange patch.

445. Suada swerga, de Nicéville.

I have two specimens of an insect, one of which was thus named for me by Mr. Elwes. They were both taken in the extreme north of Upper Burmah.

446. Suada sp.?

This insect, taken in October, 1893, in Upper Burmah, is apparently closely allied to the preceding species, from which it differs principally in the minute spot at the outward extremity of the two discal spots in the former species being conspicuous and much elongated, and in wanting entirely the three small sub-apical spots on the fore-wing.

447. Suastus gremius, Fabricius.

Taken in Sagaing and Tongoo in July, October, and February.

448. Suastus sp.

One specimen, taken near Sagaing in February, said by Mr. Moore to be undescribed. It may be an aberrant female of *S. gremius*, Fabricius.

449. S. sala, Hewitson.

One specimen taken near Moulmain and one in Upper Burmah in the cold season.

450. Iambrix salsala, Moore.

Very common. There is considerable variation in the spotting of the upper side. I am unable to distinguish this species from *I. stellifer*, Butler; my series may contain both.

451. Taractrocera mævius, Fabricius.

Taken in Moulmain, and named for me by the late Mr. Hewitson as *Cyclopides sagara*, Moore. I have since taken it plentifully in July in Toungoo.

452. T. nicevillei, Watson.

One specimen, taken near Moulmain, has all the spots bright orange instead of straw colour as in *T. mævius*, Fabricius. Mr. Moore considered it to belong to a new species, but I have very little doubt that it is correctly named.

453. Ochus subvittatus, Moore.

Numerous specimens taken in Upper and Lower Burmah.

454. Ampittia maro, Fabricius.

I have caught many specimens, both male and female, of this well marked species in all parts of Burmah.

455. Ampittia sp.?

Two specimens which I am unable to name taken in the dry zone of Upper Burmah.

456. Aeromachus indistincta, Moore.

Very common in gardens at Tounghoo in July on the flowers of the so-called Rangoon Creeper. It was in company with *Taractrocera mævius*.

457. Sebastonyma dolopia, Hewitson.

Taken at Bhamo and in the Upper Chindwin district in September. Rare.

458. Pedestes pandita, de Nicéville.

I have two specimens; one taken in March at Singoo, in the Eastern Shan Hills, and one in the hills to the west of the Chindwin River in February.

459. Hyarotis adrastus, Cramer.

Rare in Upper Tenasserim in the cold season.

460. Abnetta atkinsoni, Moore.

Several specimens taken in both Upper and Lower Burmah.

461. Zographetus satwa, de Nicéville.

One specimen caught in Upper Burmah. No record of the date.

462. Z. cephala, Hewitson.

Not uncommon among the low hills west of the Chindwin River in January and February.

463. Matapa aria, Moore.

Common in Burmah.

464. M. sasivarna, Moore.

Two specimens from Tenasserim and one from Bhamo.

465. Erionota thrax, Linnæus.

One specimen taken in November, 1880, at Moulmain.

466. Gangara thyrsis, Fabricius.

Generally spread throughout Burmah. I have frequently bred these insects from larvæ found feeding on the Palmyra Palm.

467. Kerana diocles, Moore.

Not uncommon in Burmah from north to extreme south.

468. Plastingia tessellata, Hewitson.

One specimen taken on the 9th October near Kannee Police Station, on the Attaran River, Amherst district.

469. Unkana attina, Hewitson.

One male and numerous females at different seasons about Moulmain. The male was taken in a garden in Moulmain on the 22nd August.

470. Hidari bhawani, de Nicéville.

I took a single specimen resting on a dead leaf in Arracan in February, 1883. A female.

471. H. irava, Distant.

One specimen from Mergui taken in November.

472. Pithauria stramineipennis, Wood-Mason and de Nicéville.

One specimen taken in Upper Tenasserim in October. Occasionally met with in considerable numbers in Bhamo and the Upper Chindwin districts. A local insect.

473. Notocrypta feisthameli, Boisduval.

Common in Lower Burmah, but less common further north My specimens vary much in the number of sub-apical and discal spots. The commonest form has no sub-apical series and only one of the discal series of small spots. In this form the purple-grey on the under side is entirely absent. The second form has generally the three sub-apical spots complete (though I have one in which they are all absent), while the lower series varies from one to three. In these the purple-grey of the under side is very distinct. I have now sunk *N. restricta*, Moore, under this species.

474. Udaspes folus, Cramer.

Very common throughout Burmah. July to February.

475. Telicota augias, Linnæus.

Very common.

476. T. BAMBUSÆ, Moore.

I can with difficulty separate this from the preceding species.

477. T. PALMARUM, Moore?

Two females only were caught by me in January near Moulmain. They were ticketed by Mr. Moore as "nearest to *Palmarum*."

478. T. GOLA, Moore.

I have taken several specimens of this insect both near Rangoon and also at Bhamo.

479. T. DARA, Kollar.

This is plentiful in Burmah both in the Upper and Central Zones. It is very variable in size and markings, and has been till recently known under the synonyms *Mæsa*, *Pseudomæsa*, *Mæsoides*, &c.

NOTE.—The individuals in the different species of the genus *Telicota* appear to vary much, and the species are not easy to discriminate.

480. HALPE ZEMA, Hewitson.

Throughout Burmah, July to October.

481. H. CERATA, Hewitson.

A local insect. Several specimens were taken by me on one occasion on the Upper Chindwin in July.

482. H. MOOREI, Watson.

A common species in Burmah.

483. H. SIKKIMA, Moore.

A few specimens taken in Upper Burmah in the cold weather.

484. H. HOMOLEA, Hewitson.

One specimen only taken at Kyap Sakan in Upper Burmah near Meiktila in the cold weather.

485. H. ALBIPECTUS, de Nicéville.

A single specimen was caught by me at Aloungdau Kathapa Pagoda, in the hills west of the Chindwin River.

486. H. MASONI, Moore.

I have four specimens of this insect which vary considerably. One from Singoo in the Shan Hills (4,000 feet), taken in March,

and one from Tenasserim district are larger than the other two which were also taken in Tenasserim. The larger specimens have only two sub-apical spots on the fore-wing, of which the lower one is much the larger. The other two specimens have an increasing series of three spots. The size of the yellow spot on the upper side of the hind-wing is also variable.

487. Onryza meiktila, de Nicéville.

The type specimen, captured by me at Meiktila in Central Burmah on the 15th February, 1890, is now in my collection. I have since caught one other specimen on the Upper Chindwin River in February.

488. Iton semamora, Moore.

Two specimens taken in March near the Siamese frontier in Tenasserim, and two in February on the Upper Chindwin.

489. Iton? n. sp.

One specimen taken at Kaléwa on the Chindwin River in October is nearly allied to *I. watsoni*, de Nicéville, but has a broad white margin to the hind-wing on the upper side. This is the insect referred to by Elwes and Edwards in their revision of Oriental Hesperiidæ in *Trans. Zool. Soc. Lond.*, vol. xiv., part 4 of 1897, page 269.

490. I. watsoni, de Nicéville.

One specimen taken at Pinyoung, on the Upper Chindwin, in September.

491. Parnara oceia, Hewitson.

Males and females, usually of the typical form, very common from June till November. Very variable in the number of spots on the fore-wings. The number of these spots on specimens in my collection varying from nine to two.

492. P. cære, de Nicéville.

I have one male taken at Kindat, on the Chindwin, in April, which corresponds exactly with de Nicéville's figures of *Chapra cære* on the upper side, and females taken at the same time which may belong to the same species. The male has been seen by Mr. Elwes, who was unable to name it, as it differed

from *Brunnea=Cære* as identified by him in having one minute spot on the under side of the hind-wing. Both my females have also one or two white spots on the under sides of the hind-wings, and may thus be distinguished from the females of *P. oceia*.

493. P. MATHIAS, Fabricius.

An excessively common species in Central Burmah. I have some specimens with a row of four spots on the upper sides of the hind-wings, but I doubt their belonging to another species. I have marked them as variety *Subochracea*.

494. PARNARA sp.?

One specimen taken at Sagaing, Central Burmah. Upper side corresponds exactly with *P. mathias*, but on the under side there are only two small white spots.

495. P. CONTIGUA, Mabille.

Exceedingly common, especially in the neighbourhood of Bhamo at the end of the rains. This insect was named for me as *Baoris toona*, Moore, by Mr. Moore.

496. P. GUTTATUS, Bremer and Grey.

Found commonly in Upper Burmah. This has previously stood in my collection under the name of *P. bada*, Moore.

497. P. BEVANI, Moore.

One specimen only, taken in Upper Burmah in March, and identified by Mr. Moore.

498. P. COLACA, Moore.

Numerous specimens, agreeing with Mr. Elwes' figure, and so named by Mr. Moore.

499. ISMENE MAHINTHA, Moore.

Several males and two females, taken in Upper Burmah from October to February. It is found both in the plains and in the lower ranges of the hills.

500. I. HARISA, Moore.

Caught commonly at Bhamo in July, August, and September. It was used to abound on a wooden bridge over a swamp, near Bhamo, in the early morning, where specimens

settled with their wings closed over their backs, and though disturbed over and over again would return to the same spot.

501. I. AMARA, Moore.

Caught at same time and seasons as *I. harisa*, Moore, but not nearly so common. Also in Lower Burmah.

502. I. ANADI, de Nicéville.

One doubtful bad specimen, taken near the Amherst and Siam frontier in January.

503. HASORA BADRA, Moore.

Throughout Upper and Lower Burmah, but not very common. Only one female taken which I refer to this species.

504. H. (PARATA) CHUZA, Hewitson.

One specimen taken in the Arracan hill tracts in April, 1893.

505. BIBASIS SENA, Moore.

Two specimens taken in Tenasserim and Bhamo respectively in June.

506. BADAMIA EXCLAMATIONIS, Fabricius.

Common at Akyab and near Moulmain from March to July. The size of the white spots on the upper wings varies much.

REPORT OF THE FIELD MEETINGS OF THE NATURAL HISTORY SOCIETY FOR 1906

Read April 12th, 1907, by Mr. Richard Adamson, Chairman of the Field Meetings Committee for 1906

Alderman Harkus, Members of the Natural History Society, and Ladies and Gentlemen,—Twelve months ago, when the Field Committee of the Natural History Society offered me the presidency or chairmanship (to use the more modern appellation) of the field section, I accepted the honour with great reluctance and consideration, and began its duties with much diffidence as undeserving of such high appreciation.

To-night in rendering an account of my stewardship, in giving you a resumé of the field work during the past session, in accordance with the usual custom, I feel my shortcomings even more than at the commencement, when I call to remembrance some of the eminent and distinguished men preceding me who have addressed the Tyneside Naturalists on the retrospective field work of past years.

Perhaps I have little or nothing new to tell you to-night, as we have practically re-visited old haunts, ploughing a little deeper and tilling the soil a little better it may be; but I am glad to report a large increase in attendance of members—new as well as familiar faces—who have taken a great interest in the proceedings and shewn a willing and earnest disposition to learn a little from the pages of Nature's book, as bountifully revealed to us in our bye-paths and frequented spots.

In the subject matter of my address I have endeavoured as far as possible to dispense with technical phraseology and scientific nomenclature, and have adopted the style of description I usually used in the rambles.

First Field Meeting in Derwent Valley on the 22nd May

On Tuesday afternoon of this date, the inaugural meeting of the season was held in the Derwent Valley. A large party left the Central Station at 2.35 p.m. and travelled by the Consett train to Swalwell, where I joined. After assembling in the station, the party proceeded by way of the Crow Trees and Swalwell Bridge to Axwell Park, which was entered by the Swalwell Gate on the production of a letter of permission kindly given by the Rev. H. P. Napier-Clavering, rector of Blaydon, on behalf of his father, the Rev. J. W. Napier-Clavering.

Coming immediately to the lake, several began at once in search of aquatic life. Then journeying by the walk running along the park wall-side, a good opportunity was afforded to those fond of arboriculture, for we were walking under a fine sturdy row of beeches, which throw immense branches out, both inside and outside the park. Owing to the late spring the foliage on many of them did not appear yet to be in full leafage, but the leaves that were developed, had a soft and silvery appearance due to the fringes of silky down on their margins. After crossing the head of the lake by a small stone bridge, the banky road was followed, leading up to the Hall, which is quite a modern structure, standing on elevated ground overlooking the river Derwent, and facing Swalwell and Whickham on the south bank of this river. Several very old trees in the vicinity of the Hall received much attention. The road leading west from the Hall was now followed, accompanied by grassy slopes on our right, and a dense beech wood on the left. Proceeding in this direction, we obtained a very near view of the fallow deer, browsing amongst the dry brackens a little up the slope to our right. And then the sturdy growth of beeches on the left called for further attention. Although the Beech likes a limestone or chalky habitat, it grows here on the shales and sandstones of the Coal Measures to great perfection. In its exclusive manner of growth, it has

exterminated all other classes of vegetable existence. Beneath the boughs of crowded beeches the surface soil is covered and embrowned with a thick stratum of successive annual deposits of the fallen and decayed leaves of these trees. The Beech grows so naturally and so well in our local valleys, that I am sure, had Julius Cæsar ever visited this part of wild and ancient Britain, he would certainly have found and included it in his list of British trees.

Daisies, Primroses, Violets, Cowslips, and here and there an early Orchis were noticed in traversing this part of the park. On leaving Axwell by the Hagg Hill gate, the party proceeded westward by the turnpike-road between woods of young trees, consisting chiefly of Oaks, Elms, Ashes, and Larches; then between pasture fields to Winlaton Mill—a hamlet of old dingy, tumbling down, unsanitary looking dwellings on the margin of the Derwent, historically famous locally for its busy iron-works under the old noted firm of Crowley, Middleton and Co. of the early part of the last century.

The party were next guided to the Scar Banks, an eminence lying to the west of this village. A prolonged halt was made on this elevated spot, to view the delightful panorama of scenery of wood and water. Below, and to the west, there is a fine flat haugh of some half-dozen fields of tillage land, consisting of deep alluvial soil, encircled on three sides by the river; and beyond on the south and west, we have a very fine view of the woods and farms of the Gibside estate. On the north side of the river there is the steep scar of sand and gravel above boulder clay, overgrown by young trees, and extending in a semi-circular fashion to Lockhaugh Railway Bridge.

The Scar immediately beneath our feet is a steep, almost perpendicular cliff of great height and prominence, consisting of a thick deposit of sand and gravel, over-lying a great depth of boulder clay, in which are embedded boulders of sandstones and shales. The cliffs at this point are receding owing to the denudating forces of nature, causing landslips during the winter months. Here the merry Sand Martins

abound, the Kestrel builds without molestation, the Ring Doves come for sand, and the water fowl haunt the recesses of the lonely, dark and woody bends in the river, where the otter may also be frequently seen in his fishing expeditions. Now, glancing upwards to the south, a mile or more away, may be seen at a great height the ruins of Hollingside Old Castle of mediæval times. There is no doubt some of our large party of antiquarian proclivities would like to have made a closer inspection of these historical old ruins. During our stay on the Scar, the botanists gathered Primroses, Wild Hyacinths, Adoxas, Wood Geraniums, Sweet Woodruff, Wild Chervil, Wood Forget-me-nots and Anemones.

Retracing our steps a little until we reached the turnpike-road, we began our westward course again, frequently noticing, as we went, the roadsides bedecked with a great variety of spring flowers in bloom, such as Stitchwort, Strawberry-leaved Potentil, Dog Violet, Coltsfoot, Wild Chervil, Sweet Woodruff, Goldilocks, Arum, Oxalis, Crosswort, Speedwell, Hedge Charlock, Primroses and Cowslips. The Skylarks were singing delightfully in the fields, and the Chaffinches, Redpolls, Hedge-sparrows, Green Linnets and Yellow Hammers were full of notes and calls as we moved along.

On arriving at a very defective part of the road termed the "Slide," it was pointed out that this portion of the road was continually subsiding or sinking owing to an internal movement, and in consequence it required enormous quantities of material, applied periodically, to keep it in repair. The sloping ground to the south of the road consists of an enormous cap of boulder clay overhanging the Derwent. We got a very fine view of the adjacent landscapes at this stage of our journey. Going a short distance further we came to Lockhaugh woods, which were entered by a gate from the turnpike. The wood first visited consists of a kind of plateau with very steep and precipitous slopes on the east and south. This immense hill, which adds so much to the picturesqueness of the valley, consists principally of sand and gravel overlying the boulder clay. As the section of the party who hazarded

this rather rough part of the ramble proceeded through the thick brushwood of Brambles, Thorns, Hollies, Hazels, Briars, Woodbines, dried Brackens and Hemlocks of last year, they were delighted with the luxuriance of the spring flowers.

Banks were blue with Wild Hyacinths; boggy hollows carpeted with Golden Saxifrage; Wood Anemones everywhere, but showing symptoms of fading; Wood Forget-me-nots in the moist shady spots in profusion; patches emerald with Dog Mercury; Ramsons in galore, but mostly in spathe; and Red Campions lighting up the recesses of the dells in the opening of their first blooms. After reaching the foot of the woody slope, a footpath was followed by the margin of the river, underneath the high viaduct bridge of the Derwent Valley Railway, into a coppice wood of Hazels, White and Black Thorns, Guelder Rose, Briars, Hollies, Bird-cherry, Willows, Crab Trees, Gorse and Broom. The nest of the Brown Linnet found in a whin bush, and containing one egg, is especially noteworthy, as this bird, once common in the valley, is of rare occurrence now, particularly during the nesting time. From the Gibside woods, on the opposite banks of the stream, came the notes of the Crow, Rook, Jay and Magpie, while we noticed the Greenfinch, Redpoll, Wren, Willow Wren, Whitethroat, Wagtail, Blackbird and Song Thrush on the Lockhaugh side.

The steep cliffs and escarpments of the Coal Measures on the south side of the river were of particular interest to the geologists. As we were now frequently passing over moist spots, many Cuckoo-flowers, Marsh Marigolds, Woodrushes and Sedges were observed. One of the marshy lowland fields in particular contained a great many species of the Sedge family.

After a lingering stay in this beautiful lowland spot, where we followed the circuitous bend in the river for some distance, we ascended a steep grassy slope, from the summit of which a very fine view of the valley and the well-wooded lands Gibside was obtained. In now passing rather hurriedly along

towards our destination at Rowland's Gill, we crossed over the bridge, which spans the west end of a very deep railway cutting of sand and other glacial formations. It may here be pointed out, as of some interest to botanists, that our rich and varied flora of the Derwent Valley is entirely due to the large acreage of glacial deposits of boulder clay and other drift matters, the surface of which we have practically traversed during the whole of our lengthy and interesting ramble.

Second Field Meeting at Devil's Water on the 16th June

The incessant downpour of rain on the day appointed for this meeting prevented me from attending, as I had not quite recovered from an attack of influenza. However, as the weather improved considerably later in the day, I journeyed to Hexham towards the evening, where I met a small, brave, and hardy band of naturalists returning, after spending a very profitable and enjoyable outing, in spite of the unpropitious state of the elements. Through the kindness of these gentlemen I am able to give you the following account of this meeting :—

On entering Dilston Park, the trees were the first objects of interest. The Hawthorn, Elder, Laburnum, Guelder Rose, and Lime were in full bloom. A visit was next paid to the old ruins of Dilston Castle and Chapel. Afterwards the party returned to the Devil's Water and began in earnest the day's occupation. There was very little water in the stream owing to the long spell of dry weather previous to the visit. For a considerable distance up the stream a footpath was followed through fields bordering its margin. Then by climbing steep and banky ground, a course was taken along the brow of precipitous and lofty scars and escarpments, where at each turn new sights and attractions appeared, to give fresh pleasures and new themes of contemplation to the visitors.

On descending from the cliffy walk, another circuitous path was followed through a pleasant and picturesque haugh, where

a great profusion of wild flowers of early summer were much admired. Beyond this the pine wood was entered, in which the remainder of the time at the party's disposal was spent in studying the numerous large, conical-shaped hills of the Wood Ant. These peaceful mounds, composed chiefly of the needle-shaped leaves, pieces of cones, and fragments of bark from the fir trees predominating in the wood, form immense colonies of these busy ants. To the entomologist, however, the interest lies mainly in the number of other kinds of insects, both friends and foes, which either live in or about the ant homes. Beetles, flies, woodlice, and spiders were observed, and a worm-like creature was often seen in the walls where the formic acid was strongest and most pungent.

The following birds were noticed during the ramble :— Curlew, Sandpiper, Dipper, Cuckoo, Ring Dove, Missel Thrush, Blackcap, Greater and Lesser Whitethroats, Golden Crested and Wood Wrens, Tree Pipit, Blue Titmouse, Song Thrush and Blackbird.

Amongst the wild flowers the following were recorded :— Red Campion, White Campion, Garlic Mustard, Cranesbill, Wood Geranium, Greater Stitchwort, Hop Trefoil, Bird's-foot Trefoil, Wild Strawberry, Water Avens, Herb-Bennett, Wood Forget-me-not, Germander Speedwell, Spiked Speedwell, Lady's Mantle, Bugle, Sheep's Sorrel, Wild Hyacinth, Ramsons, Wild Chervil, Bush Vetch, Slender Vetch and Bitter Vetch, Cow-wheat and Silver Weed.

After partaking of refreshments at the Abbey Hotel, Hexham, a paper on "Ant Homes" was read by Mr. Richard Bagnall, F.E.S., of Winlaton.

Third Field Meeting at Naworth on the 27th June

A very large party of ladies and gentlemen left the Central Station by the 10.25 a.m. train for Naworth.

On detraining, the party, having obtained permission to visit Naworth Castle, proceeded at once to this historic and ancestral stronghold of the Dacres and afterwards the Howards.

It was noticed that the Castle stands on a rocky eminence of triangular ground which slopes steeply down to two small streams—the Castle and Mill Becks—which unite and flow through a winding woodland course to the river Irthing. To complete the defence of the Castle a moat has been constructed on the south side or base of the triangular ground.

The visitors were greatly interested in the contents of the Great Hall, especially in the pieces of armour, old tapestry, portraits of Belted Will and his wife, Catherine Parr (sixth and last wife of Henry VIII.) who was a Howard, Mary Queen of Scots, Earl of Surrey of Flodden Field fame and Charles I. The immense fire-place of the Hall took much attention and was the cause of several jocular remarks. Several rooms were afterwards visited, including the Guard Room, Warder's Gallery containing several pieces of cabinet work, and Lord Howard's Tower, where a massive iron door prevented the flames during the fire of 1844 from reaching Belted Will's rooms.

On leaving the Castle the party entered the dene running northwards, and proceeded by a neat mossy footpath, through some very fine sylvan scenery, following the course of the stream. It took the botanical section of the visitors a very considerable time to accomplish this portion of the ramble, as there was so much pertaining to plant life to notice. Amongst the trees, which were greatly admired, were the Ash, Oak, Beech, Larch, Sycamore, Birch, Holly, Elm, and Yew, while the undergrowth of Hazel, Woodbine, White and Black Thorn, overhanging and fringing the rippling beck, pleased the eye at every turn. Then there were the wild flowers to look at. These included the Water Avens, Herb Bennet, Garlic Mustard, Wild Strawberry, Tormentil, Sweet Woodruff, Foxglove, Dog Rose, Guelder Rose, Yellow Pimpernel, Wood Forget-me-not, Bugle, Golden Saxifrage, Red Campion, Spotted Orchis, Wall Pellitory, Goldilocks, and Ramsons. The ornithologists had opportunities of seeing or hearing the Blackbird, Song Thrush, Missel Thrush, Cuckoo, Cushat, Carrion Crow, Rook, Jackdaw, Wood Wren, Bullfinch, Green-

finch, Common Wren, Willow Wren, Chiff-chaff, Whitethroat, Robin, Long-tailed Tit, and Blue Tit.

On the termination of this enjoyable woodland walk, a halt was made to partake of refreshments of home providence. Afterwards a start was made for the old ruins of Lanercost Priory, in view some little distance to the north, beyond the river Irthing. The more venturesome and resolute crossed by the stepping-stones—a rather dangerous and haphazard proceeding, as the river was in flood and running in swift currents, owing to the recent heavy rains. The others, and I was amongst these, followed the south bank of the river as far as Lanercost where the bridge was crossed. On a spacious piece of waste land close to the north end of the bridge the following wild flowers were gathered :—Tower Cress, Dyer's Rocket, Dove's-foot Geranium, Mellilot, Goat's Beard, Oxeye Daisy, Ivy-leaved Toadflax, Garlic Mustard, Geum and Cranesbill. The Wall-Rue Fern was growing very profusely on the wall near the place where the above-mentioned flowers were growing. There was a re-union of the party at the Priory, where a considerable time was spent in inspecting the ruins of the tower, transepts, and chancel. The Wallflower was seen in its natural state in full bloom. A portion of the Priory has been restored and is used as a parish church. In building the Priory the mason-monks seem to have drawn largely on the Roman Wall in the near neighbourhood for material, as the stones of red and grey freestone, in some portions of the old ruins, do not appear to have been designed for the purpose they now fulfil. The trees, chiefly large Sycamores, growing in the grounds give the Priory a very pleasing and picturesque effect. After leaving the Priory by the fine old Norman gateway, the majority of the party climbed the banky road, going eastward in the direction of Coombe Crag—a distance of two miles or so away. By persevering under a hot sun we came to Pike's Hill, where a halt was made to view the landscapes and surrounding country from this point of eminence. The distant Solway was seen very clearly as well as several summits on the Cumbrian mountains, and nearer we had a

most charming view of the valley of the Irthing. Going a short distance onward, on a now level road, we came to a foot-path on the right by which we reached Coombe Crags. Standing on the top of the most prominent jutting crag the visitors enjoyed a grand panorama of landscapes. It was in the old quarries of these freestone rocks that the Roman masons obtained building materials for the erection of the Wall and its camps situated in the locality.

The Twablade Orchis, Spotted Orchis, Butterfly Orchis, Agrimony, and a great profusion of commoner flowers were in bloom in this vicinity, and Bullfinches were several times seen in the banky woods near the Crags. A few Golden Plovers and numerous Green Plovers, as well as Curlews, were noticed in the fields and fell lands in going to and from Coombe Crags, and Starlings and Rooks were in evidence everywhere.

Geologically it may be said that we spent the whole day on the Carboniferous Limestone formation of rocks, crossing, in one or two places on the north side of the river, limestone bands during our walk to Coombe Crags.

After partaking of refreshments at Lanercost, the party returned to Naworth Station and entrained for Newcastle.

Fourth Field Meeting at Castle Eden Dene on the 13th July

I have here to explain to you that the place originally selected for this meeting was Bradbury (as stated on the card of announcements) near Ferryhill, for the purpose of seeing some ballast plants belonging to the Leguminous Family, and growing on a disused railway embankment by the side of the main line from Newcastle to the South, but as there had been large gatherings at the previous meetings, consisting of members of various tastes for nature study, and as there appeared to me to be considerable risk in leading a large party along this embankment close to which express trains were passing every few minutes, I very reluctantly resolved,

after consulting with the secretary (Mr. Robson), to abandon this place and substitute Castle Eden Dene in lieu of it. I may add that as I had previously visited this spot (Bradbury) I was fully aware of its drawbacks and dangers. It was, however, decided to hold a supplementary meeting later at Bradbury in order to give the botanists an opportunity of seeing these rare and beautiful ballast plants, brought under our notice by Mr. E. Potts, one of our fellow members*.

The Castle Eden meeting was held on the 13th July. Again the day was delightfully fine. Arriving at Castle Eden Station, early in the afternoon, we started at once for the Dene, which we reached shortly, after passing through a field where harvesting operations were in full swing in a field containing a heavy crop of old land hay.

Through the kind permission of Colonel Burdon, we now passed through the gate into the Dene—a veritable paradise to the North Country naturalist. The Dene was at the height of its sylvan beauty. The magnificent forest trees, the choice and rare variety of wild flowers and ferns, the limestone crags and caverns, and the presence and variety of bird life, form a sort of natural museum in which the botanist, geologist, and ornithologist may each renew his acquaintance, as well as even add new matter and facts to his knowledge of nature. The Gunner's Pool, the romantic little spot first visited, owes its presence to a "trouble" or fault below the limestone.

Amongst some remarkably fine trees I noticed the following :—Elm, Beech, Sycamore, Lime, Oak, Ash, Hornbeam, Poplar, Birch, Yew, Larch, Scotch Pine, Holly, Aspen, Alder, and Rowan or Mountain Ash. Ivy hangs prodigiously and gracefully over the declivities and recesses of the limestone escarpments. The beeches grow to great perfection in their favourite habitat of limestone soil. An avenue of yews is one of the features of the Dene.

* See note on "Ballast Plants at Bradbury, Co. Durham," by Mr. Edward Potts in *Nat. Hist. Trans.*, vol. xiv., 1903, p. 283.

A few of the flowers noted may be mentioned as follows :— Rock Rose, Milkwort, Lesser, Greater, and Wood Stitchwort, Cranesbill, Wood Geranium, Water Avens, Agrimony, Stone Bramble, Greater Willow Herb, Enchanter's Nightshade, Wood Sanicle, Angelica, Valerian, Hemp Agrimony, Privet, Comfrey, Wood Forget-me-not, Wild Thyme, Speedwell, Bugle, Ground Ivy, Yellow Pimpernel, Twablade Orchis, Butterfly Orchis, Spotted Orchis, Black Bryony, Ramsons, Musk Mallow, Fragant Orchis and Epipactis.

Amongst the ferns the following were noticed :—Oak Fern, Shield Fern, Holly Fern, Male Fern, Lady Fern, Broad Buckler, Green Spleenwort, Maidenhair Spleenwort, Harts-tongue, Hard Fern, and Royal Fern. Several Horse-tails or Equisetums were observed, of which the Great Horse-tail, the Shade Horse-tail, the Wood Horse-tail, and Rough Horse-tail were frequently met with. Towards the sea-end of the Dene the Lily-of-the-Valley and Privet grow naturally in great profusion, the latter being in bloom at the time of our visit. There were immense beds of Ransoms in fruit.

As the season of song of many of the birds was past, very few of them were heard, and the list therefore was limited to the following :—Common Wren, Chiff-chaff, Wood Wren, Willow Wren, Blackbird, Song Thrush, Missel Thrush, Long-tailed Titmouse, Blue Titmouse, Tree-creeper, Ring Dove, Greenfinch, Rook, Jackdaw and Bullfinch.

On emerging from the Dene, much time was spent in examining the great profusion of wild flowers growing on the level, expansive, grassy patch of ground in the neighbourhood of Dene Holme. The Blood Geranium and Meadow Geranium were in full blossom and grew in profusion. Then too there were such rich patches of leguminous plants, amongst which were the Restharrow, the Melilot, Purple Clover, Dutch Clover, Hop Clover, Bird's Foot Trefoil, Kidney Vetch, Tufted Vetch, Bush Vetch and Meadow Pea.

After visiting the refreshment rooms at Dene Holme, some of the party proceeded along the firm and sandy beach to see

the Black Hall rocks and caves, where a similar deterioration of the Magnesian Limestone to that at Marsden and Roker has happened, but perhaps on a grander scale than the latter places. Others wandered about the boulder-clay capped cliffs in search of botanical specimens, and judging from the following blooms noticed or gathered, this part of the ramble was a success:—Agrimony, Arrow-grass, Red Bartsia, Scorpion Grass, Tansy, Toad Flax, Figwort, Oxeye Daisy, Burdock, Thyme, Yarrow, Lady's Fingers, Meadow Sweet, Marsh Potentil, Great Burnet, Burnet Rose, Field Rose, Great Willow Herb, Broad Equilobe, Burnet Saxifrage, Sweet Cicely, Spotted Hemlock, Marsh Galium, Heath Galium, All-heal Field Scabious, Sneezewort, Common Hawkbit, Cat's-ear, Mouse-ear Hawkweed, Harebell, Sheep's-bit, Common Heath, Shepherd's Weather-glass, Field Gentian, Brook-lime, Eye-bright, Woodsage, Self-heal, Sea Plaintain, Buck's-horn, Plantain, Sun Spurge and Orchis. The presence of many of the above plants is due to the drift deposits of boulder clay.

Our day's outing on this occasion was mainly on the Magnesian Limestone, which extends from South Shields to some little distance beyond Hartlepool, stretching westward into the county as a narrow band as far as Sunderland, and then widening out over the coal until it covers a considerable portion of south-east Durham; and the bold, rocky and picturesque coast scenery depends on this limestone formation. Owing to the thin and poor character of the soil of the Magnesian Limestone, the crops suffer considerably during a dry season.

At the time of our visit some very good crops of young turnips were noticed here and there, and they were considerably more advanced than the same kind of crops on Tyneside. The hay, chiefly in pike, appeared a heavy crop in a few places. Success in farming such poor land depends almost entirely on the manurial matters added to it during the tillage operations.

Fifth Field Meeting at Middleton-one-Row on the 13th September

Owing to an urgent and unexpected professional claim on my attention just as I was preparing to leave home, I was unable to be present and participate in the enjoyment of this appointment. The following account is therefore based on a very full and excellent press notice of the meeting which appeared a few days afterwards. On arriving at Darlington station it was ascertained that there was about an hour to wait before the train left for Dinsdale, so the party utilised the interval by a visit to the public park through which the river Skerne flows. A large boulder of Shap granite took the attention of the visitors immediately after entering the grounds. It had been conveyed from the bed of the Tees at Winston, near Gainford, where it had been deposited during the glacial times. The collection of aquatic birds, swimming and diving in the stream, was of a very entertaining nature. Tall and stately trees added immensely to the attractions and picturesqueness of the park. Some time was spent in inspecting the flower beds, which were still in full bloom. Returning to Darlington station, the party entrained for Dinsdale. On detraining the visitors at once proceeded through the hamlet of Middleton St. George on to Middleton-one-Row, a long straggling village once quite famous as a sort of minature Harrogate owing to the discovery of a mineral spring of sulphurous waters, which drew crowds of sufferers of internal derangements. Here on the ridge of grassy slopes of the river's banks, the houses with their neat kept gardens and embowerments of creepers have a quaint and pretty appearance. Then beyond there was a good view of the tortuous windings of the Tees and the grass and arable lands of its valleys.

The party now proceeded by a very fine woodland walk up the river, where many autumn blooms were noticed. Amongst them may be mentioned the Wood Scabious, Golden Rod, Nipplewort, Knapweed, Ragwort, Harebell, Foxglove, Wound-

wort, Geum, and Greater and Lesser Willow Herb. Of the bird life, the Sand Martin, Redpoll, Chiff-chaff, Wren, Blackbird and Thrush were seen. After walking through these charming woods of fine growth of Oak, Beech, Elm, Lime, Fir, Ash and Sycamore, the Spa Hotel was reached, where luncheon was served to about a dozen gentlemen who had joined in the day's pursuits. Before leaving the hotel, hearty votes of thanks were accorded to Sir Henry Havelock-Allan of Darlington, Sir Edward Blackett of Matfen, and Mr. J. Thompson of Over-Dinsdale for their kind permission in allowing the members of the Natural History Society to visit their respective estates in this locality; also to Mr. Edward Wooler of Darlington for his kind assistance in organising the visit.

Soon after recommencing the ramble the rain began to fall rather copiously, but shelter being somewhat afforded by the trees, the party proceeded, noticing as they went some patches of Golden Tansy, Pinked-tipped Soapwort, and a profusion of Hemp Agrimony, growing by the border of the stream, and various kinds of thistles with downy heads, laden with ripe fruit in store for the finches requiring food during the winter months. Through the kind and courteous guidance of Mr. Allen Havelock-Allen, the party proceeded by some pretty and winding paths to Over-Dinsdale, where some time was spent in visiting the church to see several old relics belonging to the ancient original Norman structure.

The remainder of the programme had to be abandoned owing to the unpropitious weather. Some of the party proceeded onwards through Nesham and Hurworth to Croft, while the others returned to Dinsdale and entrained for Newcastle.

Sixth Field Meeting at Alnmouth on the 9th October

This was the last of our Field Meetings of the 1906 session. It was the only coast one of the series. The members—a large gathering considering the lateness of the season—met at

the Central Station, and travelled to Alnmouth by the 9.35 train. The morning was delightfully fine and sunny. During our journey to Alnmouth we were surprised to see some of the cereal crops still in stook in many places, although the harvest for grain crops had been an exceptionally early one. In passing the stack yards at one or two places, however, it was noticed more energy had been used in the harvesting operations, as the corn was not only stacked, but each stack had been neatly covered.

On detraining it was decided to proceed by road to Boulmer, and then southwards by the coast to Alnmouth. In passing through Lesbury the flower gardens and trellis-work cultivation of the few straggling way-side houses were greatly admired, as the autumn blooms were still in very fine condition, and demonstrated fully the open and genial fall of the year. There was also still a vast array of wild flowers in the hedge-rows and road sides. In sauntering along in such beautifully warm sunny weather observing this wealth of Flora's queendom, I collected specimens of the following plants in bloom during this early part of the ramble:—Ragwort, Nipple-wort, White Campion, Red Campion, Harebell, Hawkweed, Yarrow, Sneezewort, Golden Rod, Wood Sage, Agrimony, Toadflax, Tufted Vetch, Spear Thistle, Woundwort, Knapweed, White and Purple Deadnettle, and a solitary bloom of Speedwell.

Then there was a good deal of bird-life to see in this long country walk. Flocks of Starlings and Rooks were frequently noticed in the pastures; Greenfinches and Yellow-hammers were often in company in the hedges; Skylarks were numerous and even now and again heard in song; numbers of Linnets were on the stubbles searching for the seeds of the Plantain, Red Bartsia, and Knot-grass; and large flocks of Green Plovers were noticed in the turnip fields.

The following plants were seen growing profusely as weeds on some of the arable land:—Sow Thistle, Fumitory, Creeping Veronica, Henbit Deadnettle, Wild Carrot, Field Madder, Self-Heal, Field Scabious, Red Bartsia, Corn Spurry and

Sunspurge. The pasture fields were carpeted with daisies just like an April day.

On halting on one occasion to look over the gate into a stubble field, I drew the attention of two or three of the members who remained behind with me to a flock of sheep "cropping" the young clover growing amongst the stubble. I pointed out that I always considered this as a wrong practice in farming, as the clover, denuded of its foliage in such a young stage so late in the year, was unable to resist the severity of the winter frosts owing to the tender nature of its roots, thereby causing a diminution or total absence of clover in the following seeds' crop of new land hay.

Being by this time hopelessly behind the advanced party, a short lane eastwards was followed by which we reached the coast in a short time, and thus coming to the front by a kind of flank movement. After spending a few minutes at luncheon I took an extensive ramble on the links amongst the sand dunes, which were covered with brown-coloured brackens. While rambling thus, I gathered belated blooms of Creeping Potentil, Thrift, Wild Celery, Scurvy Grass, Saltwort, Bur-reed, Agrimony, Blood Geranium, Buckshorn, Plantain, Sea Purslane and Storksbill. The dried, withered capsules of the spring blooms of Primroses and Cowslips were noticed everywhere.

As it was low tide, and being anxious to see something of the flora and fauna of marine life about low water mark, I, after having luncheon for the second time while sniffing the sea breeze, crossed the beach to a dark patch of rocks. Here I had a good opportunity of seeing a fine growth of a great many of our sea-weeds, including several kinds of the yellow, green and red classes. Amongst the yellow kinds there was a profusion of the four species of Wrack, viz.: the one with bladders or floats in pairs, the one with single bladders, the one with toothed margins of bladderless fronds, and the smallest of the four containing narrow fluted fronds, also minus of bladders. The two Laminarias or Tangles were

loosely strewn about. Of the green kinds, the commoner Green Laver and Sea Grass were seen everywhere on the large stones and rocks. Time did not permit to notice in detail the various kinds of red sea-weed I saw in the rock pools. One of them, the Coralline—a beautiful plant with jointed pinnate fronds of a brittle and limy nature—was growing in great profusion in almost every pool.

I now had very little time left to carry on a prolonged investigation, as the tide had turned, and my fellow naturalists were urging me from the coast, to move on to Alnmouth, where refreshments would be ready. The little time left was devoted to the animal life frequenting the rocks. I noticed several times a dark brown oval jelly-like mass, which was found to be one of the kinds of anemones of the Beadlet variety. The limpets were everywhere clinging to the rocks, and in many instances were themselves covered with the little fishing barnacles or acorn-shells, and the slate-coloured variety of periwinkle was noticed in great numbers. There were also crowds of small mussels present on many of the rocks. Several crabs of the common sort were seen, and good specimens of the Five-fingered and Sun Starfish were met with.

On leaving this interesting locality I was much puzzled by the flight of a large flock of Starlings hovering near the same spot on the shore a little above high-water mark. On approaching their haunt I found some very large heaps of sea-weed, principally consisting of tangle, in a highly decomposed state, possessing a very disagreeable odour. On turning some of it over I discovered a good deal of maggot life, consisting of the larvæ of dipterous insects. It was concluded that the presence of these grubs was the source of attraction of the Starlings. Strolling rather leisurely southwards along the beach, enjoying the sea-breeze, which was tempering the heat of the sun to a delicious warmth, I came to several shingly spots which afforded chances of seeing the various kinds of pebbles and tenantless shells. There were to be seen specimens of the Common Wentletrap, the Cockle, bits of the Razor Shell, the Common Scallop, two or three of the Whelk,

and a few Pearl-tops. Many stranded jellyfish were to be seen scattered about the shore. They appeared to consist of two or three varieties, but time was too short to distinguish the kinds of these glassy looking masses.

Coming to a large bay a little distance to the north of Alnmouth, I was greatly surprised to see such a large number of immense boulders strewn therein, and consisting chiefly of basalt, sandstones of the Millstone Grit, and Carboniferous Limestone. It was while sitting on one of these large boulders eating my third luncheon that I took a few minutes to watch the sea-birds chattering noisily as they were shifting their quarters owing to the flowing tide. Among them I noticed the Kittiwake, Herring Gull, Common Gull, Lesser Black-backed Gull, Black-headed Gull and Common Duck. Curlews were seen several times as I neared Alnmouth.

I greatly regretted the want of time to inspect the pebbles a little more closely, as they form a most interesting and instructive chapter in Nature's book. Just a glance at them showed them to be great travellers, as I saw pebbles of granite, chalk, Magnesian Limestone, jet, Carboniferous Limestone, flint, quartz, porphyry, greensand, felspar and coal.

After luncheon we still had plenty of time on hand, so it was decided to follow the coast to Warkworth. Crossing the water by the ferryboat, we spent some time in searching the swampy mouth of the Aln for marsh plants. Here I called the attention of the party to a few late blooms of one of the rarities of the outing, viz., the Sea Aster *(Aster Tripolium)*. This plant, together with its near relation, the Goldilocks Aster of the limestone cliffs on the west coast, may be said to be our only British Asters. Then there was a great abundance of Sea Samphire (in fruit) in this salt marsh. This plant also is of very rare occurrence in northern England.

As the rain now began to fall freely, the journey to Warkworth, which otherwise would have been very enjoyable, was rather an unpleasant and irksome one; and excepting a

stoppage to view at some distance off a promiscuous gathering of sea birds, consisting of two or three kinds of Gulls, Ringed Plovers and Dunlins, the remainder of the ramble was uneventful.

Ladies and Gentlemen,—I am glad I now have the opportunity of thanking the Field Committee for the honour they conferred upon me a year ago, and I also heartily thank the ladies and gentlemen who accompanied me in the rambles for their companionship, courtesy, and forbearance; and express a sincere hope that I may have the pleasure of their society in the pursuits of future field work.

To our energetic and obliging secretary, Mr. Robson, I am greatly indebted, and hereby express my warmest thanks and deep gratitude for his kindness and attention, and I offer him my sincere congratulations for the highly successful arrangements of the meetings.

If I may be permitted, I would like to add a few words in conclusion pertaining to our pastimes as naturalists.

In our endeavours to classify, arrange, and record a little of the manifold subjects of the kingdoms of Nature as we find them bountifully distributed in her realms within our own reach, it should be our earnest aim and duty, in making use of the special talents with which we are endowed, to preserve the creatures of the Great Creator, and promote their welfare by stemming the tide of wanton destruction which emanates from the "lords of creation" who know nothing and care nothing for the marvellous revelations and beauties met with in Nature's byepaths.

I would like to see the crowds, who are now cheaply transported from towns to the country by railway companies and promoters of fresh air funds, educated a little in nature study, so that they may show the same respect and reverence for the wild life of our country lanes, fields and woods, as they have already learnt to do for the tame and cultivated objects

of their parks, which they admire so much and guard so religiously by little admonitions such as "keep off the grass," "do not pluck the flowers," etc., at every turn one takes in visiting them. We want the toilers of the towns to come into the country, enjoy the clear bright sunshine, and inhale to the full capacity of their lungs the pure air with its oxygen newly re-created by the action of the greenness of the vegetation and the sunlight; and further we want them to learn as much of Nature's book as they can; but we earnestly hope they will desist in their pillage and plunder, and allow Nature's creatures to remain unmolested, so that posterity may be blessed with the same pleasures and enjoyments of rural life we ourselves experience.

Personally, I do not advocate collecting for the sake of proudly becoming the owner of a cabinet of dried or dead specimens. To my mind the aim of a true naturalist is to see and study the object in its habitat as a living creature. To watch a plant spring from a seed, develop a stem, branches, leaves, blossoms, fruit, and lastly seed, and to notice the shape of its leaves, colour of its flowers, insects visiting it, soil it grows in, and so on, is more instructive and supplies us with greater delights and deeper study: or again to note the time the rare bird of passage arrives in the spring, its search for a mate and choice of a nesting place, its care and attention in rearing its family, the food it gives its nurslings, its own "bill of fare," its use to the farmer and gardener, its own peculiar manner of flight, its notes or song, its flocking propensities, and its time of departure in the autumn, is better and nobler work than merely to get possession of its skin or its clutch of eggs. It is only when pursuing nature study in this way that we find out how little of this beautiful world we know, in comparison with the vast amount we do not know, and that we find our natural life far too short for the investigations we are anxious to pursue.

THE NORTHUMBERLAND COAST IN SEPTEMBER.

AN ORNITHOLOGICAL RAMBLE*

By George W. Temperley

"Time and tide wait for no man," but by reference to the Nautical Almanac, man may select that time and that tide which are best suited to his purpose.

So, when the local tide-table informed us that, on September the twenty-third, the tide would be at its highest two hours before sunrise, we knew that the date was fixed for our expedition to the Northumberland coast. What we desired was to see the wide stretch of mud and sand in Budle Bay lying exposed by the ebbing tide, so that we might study the birds, which, in countless numbers, make it their feeding ground.

The bird life of our coast is particularly interesting in the month of September, because of the great variety of species which may then be met with. Besides those species which may be called "residents," since they are found on our shores all the year round, there are large numbers of "winter visitors" then arriving—birds which leave our coast during the breeding season, but return in the autumn to winter with us. At this time we may also chance to see some of those birds which only touch our shores on their southerly migration, calling here for a few days or hours, while *en route* for their true winter quarters. To this category belong the Greenshank, the Whimbrel, the Stints, and a few other rarer birds. The month of September is also interesting from the fact that many of the birds are then changing or have just changed their plumage, and are appearing in their winter dress for the first time.

So we set forth, well armed with the only true weapons for a field naturalist—a pair of powerful prismatic binoculars and a note-book and pencil.

* An essay sent in for the Hancock Prize competition.

We first struck the coast at Waren Mill, at the head of Budle Bay, and there, standing on the bridge which carries the road across the Waren Burn, we looked out upon the wide expanse of mud, sand, and water, which lay stretched out before us. After passing under the bridge the burn hurries over a few mossy rocks in the form of a little cascade, and then meanders out over the waste, leisurely seeking its way to the sea.

On the rocks below us stood a Dipper, anxiously bobbing up and down, looking now this way now that. He had evidently reached the limit of his fresh-water feeding grounds, for as soon as he saw us he sped away up stream under the bridge.

From where we stood we could see the mud-banks dotted over with birds as far as the eye could reach. Near at hand we could distinguish long-billed Curlews stalking solemnly over the green *Zostera*, active little Redshanks running along the sandy banks of the stream, grey and white Sea-gulls washing themselves assiduously in the shallower waters, and pied Peewits standing on one leg sleeping in the sun. By the aid of the glasses we explored the more distant reaches, only to find a repetition of the same scenes—more Curlews, more Redshanks, more Gulls, and more Peewits, as far as the glass could carry.

Leaving the bridge we turned along the road towards Bamburgh, passing the old, and once important, mill of Waren. Here we noted a large and healthy clump of Comfrey *(Symphytum officinale)*—quite an uncommon plant in the county of Northumberland. As we followed the turn-pike, which here skirts the shore of the bay, fresh vistas of mud and sand opened out before us, stretching away to the north as far as the sand-dunes of Ross, and bordered on the east by the open sea, far out across the long yellow sand-bar.

Taking our stand by the roadside we were able to make a more particular survey of the animated scene before us. Our ears were assailed by the continuous screaming of the Gulls,

as they quarrelled with one another over their food. As they rose to change their feeding ground or bathing pool the clangour increased. Parties of Gulls were continually arriving from inland forays, and came sailing down on beautiful grey and white pinions to join their companions on the shore. The weird cry of the Curlew, as it rose and swept with outstretched wings low over the mud, recalled to our minds the heather moors and the grass-clad slopes of "Cheviot's mountain lone," where we had heard that same note in the spring time. The shrill note of the Redshank was very distinctive: this too nearly always uttered when the bird was on the wing.

A careful examination of the darker mud-banks further out disclosed a large number of greyish birds standing in a scattered group, hardly visible to the eye because of their sombre colouring. These were Knots, countless hosts of which visit our North-East Coast in autumn and winter. While we watched them, the whole flock, quite one hundred strong, suddenly took alarm, and rising from the mud swept up towards us. As they came we could hear the "swishing" sound made by their many wings. They approached near enough for us to distinguish with the glass some details of their plumage, then suddenly, turning as one bird, they swept out towards the sea. On the wing they may be distinguished from Redshanks, which they resemble in size, by the absence of the red legs and feet, and by the much lighter colouring of their backs and wings. The Redshank on the wing, when looked at from above, is very dark brown and white, while the Knot is grey and white. Viewed from below the Knot is greyish-white right up to the chin—thus distinguishable from the Turnstone, which has dark markings on throat and upper breast. These points are important to observe, as the flight of all these waders is so rapid that smaller details of plumage are not discernible.

The road now climbs to a higher elevation, and we followed it for a short distance in order to get a better point of vantage from which to view the wide expanse of exposed mud in the

bay. From this point we looked far out to the Holy Island of Lindisfarne with its castle and ruined priory on the north—to the sand-bar with its fringe of white breakers to the east—and inland to the Kyloe Hills and the more distant outlines of Cheviot and Hedgehope.

By a careful scrutiny of the surface of the mud flats we were able to discover a small party of Sheldrakes far away towards the Ross Links. The distance was too great to see many details, but we could make out their white plumage flashing in the sunlight, contrasted with their dark heads and buff-coloured breasts. Somewhat nearer to us was a solitary member of the duck family floating on a shallow pool. From its small size we thought that it might be a Teal, but it was so sombre of hue that in the distance we could not make out any distinguishing feature in its plumage. Far away across the waste we could see two or three Herons standing on the edge of a muddy pool. They appeared to be resting after the piscatorial labours of the early morning, and doubtless good digestion had not waited in vain on appetite.

We now turned our attention to the Gulls, in the hope of being able to distinguish to what species they belonged. But here we were met by the usual difficulties. The mature birds, which were decidedly in the minority, were easy to identify. The Great Black-backed Gull was unmistakable; by his large size he made all the rest look mere pigmies. Even immature specimens were easily picked out. The mature Lesser Black-backed Gulls were marked out by their handsome dark plumage, and the quite mature Herring Gulls we also knew; but when it came to distinguishing between the immature specimens of these two species we were quite at sea, and had to admit ourselves beaten. The smaller size of the Black-headed Gulls, with their bright red legs and bills, singled them out, but except for a few dark dots their heads were now free from the smoky black hoods which are assumed in the breeding season, and from which the bird takes its name.

Just below us on the margin of the winding Waren Burn were numbers of Redshanks running over the sand or wading in the shallow water, actively picking up small items of food. Their pretty red legs flashed in the sun. They have a peculiar jerky motion of the head and neck when they stand upright, as if they found a difficulty in satisfactorily balancing their little brownish bodies on their long slender legs. Suddenly our attention was struck by what appeared to be a grey Redshank standing "waist deep" in the flowing water. Time after time it plunged its grey head and white neck into the stream; but it seemed determined to stay where it was, and give us no chance of a closer investigation. At last it came ashore, and as it stood in the bright sunshine we were able to examine it more closely. Top of head and back of neck grey; chin, throat, and shoulders white; breast, belly, and rump pure white; tail, when shewn in flight, nearly white; back and wings grey with a tinge of brown; bill black, long, and just slightly turned up; legs long, greyish green. It was perhaps the legs more than anything else which gave it away—it was a Greenshank—a scarce bird here, and merely a passing caller on its autumn migration. As we watched this interesting bird it took to flight and sped fifty yards further down stream, there to continue its wading operations with renewed vigour. Turning again to the spot which it had just vacated we were delighted to find a second Greenshank in exactly the same place. It must have alighted just as the first one flew away. After that we very carefully examined every Redshank in the vicinity, and there were many, in the hope that it might turn out to be a Greenshank which we had previously overlooked; but we were disappointed—not another could we find. We had certainly not expected to be so fortunate as to meet with Greenshanks, as according to Mr. Abel Chapman, a good authority on the movements of the birds on this coast, the latest date for seeing them is September 20th. As a matter of fact we visited this same spot four days later (Sept. 27th) and again saw a solitary Greenshank in the same stream. It was probably *not* one of the two birds

mentioned above, as its plumage seemed appreciably darker in hue.

We now left the road and scrambled down to the beach, through a small straggling plantation in which grows abundantly the Sea-buckthorn *(Hippophæ rhamnoides)*, an uncommon shrub of very local occurrence in this country.

Our appearance on the shore put to flight many of the birds, and the chorus of noises increased to a regular din as Gulls, Redshanks, Curlews, and Peewits flew off to a safer distance.

In spite of the lateness of the season we found a few plants still in flower here. The Sea Aster *(Aster tripolium)* grows close down to the edge of the mud and still showed a few purple and gold flowers. The higher banks were gay with Yellow Ragwort *(Senecio Jacobæa)*, on nearly every plant of which were feeding the beautiful black and gold caterpillars of the Cinnabar Moth *(Euchelia Jacobææ)*. The tall blue spikes of Viper's Bugloss *(Echium vulgare)* were beautiful to look upon; while the tall straight stems of Dyer's Rocket *(Reseda luteola)*, now nearly all in seed, showed traces of departed glory.

At this point we passed the remains of some ponds surrounded by stone dykes, which had been fitted with sluice gates. These had been originally built to provide suitable quarters for the breeding of oysters. But the difficulties of oyster-breeding were too great to be overcome, and in the end the enterprise had to be given up. So now, except for a few oysters put down each year to "fatten," the beds are occupied by mussels, which are cultivated partly for food, but chiefly for use as bait by the fishermen.

Following the shore without further adventure we reached the rocks below the Bamburgh Golf Links, and came in touch with the salt sea waves at last, the sight of which was a delightful contrast to the eye, after looking across the waste of mud and sand.

Here we were conscious that there was one thing lacking—there were no Terns to be seen. The great majority of these graceful birds had already left our shores for a more southern clime. Any to be met with now would be mere stragglers from further north; the local breeding birds having disappeared. As late as five days ago (September 17th) we saw quite a number of them from these rocks, and as we watched them diving headlong into the waves, up came their arch enemy the piratical Skua and chased them unmercifully. He was a fine bird—an Arctic, or Richardson's, Skua of the darker type. As he wheeled after the Terns he spread out his tail, which, owing to the longer central feathers, appeared almost wedge-shaped. In his dashing flight he reminded us of some kind of hawk or falcon.

But if the Terns were not there to dive for us, the Gannets were. These huge birds hurl themselves into the water with a tremendous splash which is visible far out to sea. Their diving attitude is perfect. With wings sloped back and neck outstretched they plunge headlong into the waves, and must reach a considerable depth. Except for the primaries which are jet black, and the head which is a dull yellow, the full grown Gannet is a dazzling white bird. In the sunshine it can be seen as a bright speck at a great distance. No Gull can compare with it in the snowy whiteness of its plumage. The young birds, however, are a dull smoky brown, their plumage just lightened by a tiny fleck of white on each feather. At a distance they are hardly distinguishable in colour from young Cormorants, though, of course, of a very different shape. Their longer wings and thicker, shorter necks will identify them either when on the wing or when swimming on the water. We were much amused by watching one young Gannet which had evidently not learned the true art of diving. It kept its wings fully outspread instead of sloping them backwards, and dived sideways, making a terrific splash, and hardly succeeding in submerging its own body. Whether it secured any food by this awkward method of fishing we were unable to discover, but it worked very diligently for a long while.

We carefully examined the rocks on which we now stood, and there, down by the water's edge not fifty yards from us, we discovered quite a number of small waders. Some of them so much resemble the colour of the seaweed, that at first it was not easy to pick them out. The most attractive group was a small flock of Oyster Catchers—very gay in their pied plumage, with bright red legs and orange-red beaks. By the aid of the glass we were able to notice that the white ring which is assumed in winter was not yet visible under their chins. One or two of the birds were not quite so jet black as the others, and had legs of a dull pink colour: their beaks also were duller in hue—the orange colour only extending about half way towards the tip, the remaining part being dull brown. These birds we thought must be the young of this season. But the flock did not remain long for us to examine it; the birds soon rose and flew off in an irregular line, uttering their shrill whistling note. On seeing a flock of Oyster Catchers flying directly away from one, it is surprising to notice how much white plumage becomes visible. The white underparts, white tail-coverts, and white great wing-coverts are all shown, while the black heads, necks, and shoulders are all hidden. At first sight it is almost impossible to believe that the birds are really Oyster Catchers, until the flock swerves and the birds are seen at a different angle, when the black parts come into view again.

Further out on these rocks two Curlews were striding about, and with them another bird, smaller than they, and yet very like them in general appearance. It was darker in the colouring of its upper parts; had a much shorter, though curved beak, and wore a narrow line of light feathers on the top of its otherwise dark head. We had no doubt but that it was a Whimbrel, and when it flew away uttering an oft-repeated short whistle we knew that we were not mistaken.

Among the other waders was a flock of Turnstones, actively running over the seaweed with their short red legs. The tortoise-shell colouring of their backs, and the pretty black,

brown, and white markings on their upper breasts make them attractive and beautiful birds to watch. As yet the brown markings were still quite visible, but later in the season they die away to a greyish colour. It is amusing to observe a flock of Turnstones when searching for food upon the beach. They carefully turn over stones, shells, and bits of seaweed in the hope of discovering small crustaceans beneath them. If the piece of seaweed is large they will rear it up with their beaks and then push it over with their breasts in a most workmanlike fashion.

We here got a closer view of a number of Knots, which, when on the rocks, appeared to be much less timid than those we had seen on the mud flats. Very pretty soft grey and white birds they are, some of them with a tinge of buff still on their plumage. Later on we picked up a dead specimen on the sands, and had a careful examination of the details of its form and plumage. Its length from tip of bill to tail was 9½ inches. Its bill was straight, black, 1½ inches in length. Legs and feet dull olive-green; toes four in number, three in front united at the base only, one behind very short. Head and neck ash-grey with a buffish tinge. Feathers of mantle smoky-grey, with darker edges and whitish tips. Chin and breast white, flecked with grey and just tinged with buff. Belly white. Feathers of rump white, with blackish transverse markings. Tail grey-black, without bars. Primaries grey-black. Axillaries white with greyish-black bars.

A few Dunlins were running about near a rock pool. Most of them had still the patch of black on the lower breast, but in some cases this had almost disappeared except for a few scattered black dots. Their plumage was just undergoing the change which takes place between summer and winter.

Following the shore we passed over the well-known Stag Rocks, which are interesting to the geologist as showing the junction of the limestone and the basalt. Their fantastic shape is the result of the difference of the weathering of the two strata.

Next we walked along the fine stretch of open beach which lies in front of the noble Castle of Bamburgh. Presently we came to the ridge of seaweed-clad rocks known as the Islestone. Here we found that the tide was rising fast, and setting rapidly past the end of the ridge. In the broken water formed by the swirl of the tide was a large flock of Eiders. On counting them we found that the flock numbered ninety-one birds, most of them drakes; though there were three ducks near them, and one or two young birds which might have belonged to either sex. Most of the drakes now wore the full plumage, though a few had patches of sober brown on back and head showing that they were just emerging from their "eclipse." Among them were two Scoters—smaller in size than the Eiders, and of quite a different shape. Their jet black plumage was only relieved by the yellow on their bills. Both species of duck were busily diving for food.

Further out to sea a flock of black ducks suddenly took wing; and, as they flew off, we recognised them to be more Scoters. With them were two which differed from the rest by having a white bar across their wings, which was quite conspicuous in flight. These two birds were the less common Velvet Scoter. A few moments later a small string of four birds came towards the shore, and we saw distinctly that they were Velvet Scoters. They were of a beautiful jet black colour, with white bars on their wings and white spots near their eyes. The white eye-spots give them a most uncanny look, for in the distance they appear to have exceptionally large white eyes. They alighted in the water not far from the Eiders, but appeared ill at ease, and soon took wing again for the open sea.

The Islestone rocks are well adapted for watching birds. The bedding of the basalt of which they are composed slopes away to the north, leaving a rocky face to the south, behind which it is possible to stalk the birds feeding nearer the sea. Creeping down under this cover we were able to approach the flocks of small waders, who were busily employed searching

for food close to the edge of the incoming waves. Here were small groups of Knots, Turnstones, and Dunlins all mixed up together, with an occasional Oyster Catcher, looking quite large compared with its smaller companions. So near did we get to these birds that we were able to study all the smallest details of form and plumage. Here and there was a single Ringed Plover; while on the beach beyond the rocks was quite a flock of these little birds running rapidly over the shining wet sand and daintily picking up tiny morsels of food.

It is very interesting to notice how many different species of small waders will associate together in one flock. Visiting this spot a few days later we saw a little flock consisting of four Ringed Plovers, two Dunlins (then in full winter dress), and two Little Stints. They ran about together, took wing together, and flew in one little bunch, which turned, twisted and wheeled in the air like a well organised unit.

Turning our glasses out to sea we had a splendid view of the Farne Islands. The rocky precipice of the Farne itself crowned by its white lighthouse and other buildings stood out boldly in the bright sunlight. Further north was the whitened Megstone, on which by the aid of our glasses we could see the black Cormorants, many of them standing in their characteristic attitude with wings a-stretch to the breeze. Occasionally we would see one of them fly off across the waves to its fishing grounds. At times the long neck of a Cormorant would pop out of the sea close at hand, and disappear again almost immediately as it dived below. It is quite surprising the long time for which they will stay under water. When alarmed the Cormorant will swim very low in the water—its back almost a-wash with the waves, and only its head and neck sticking out inquiringly. From this position it can dive again without a splash.

From this point we were also able to watch a Shag, or Green Cormorant, fishing out at sea. They appear to be less common here than the ordinary Black Cormorant; or perhaps it may be that they do not come near the shore so frequently.

Last year we found a colony of Black Cormorants breeding on the Farne Islands, but although there were one or two Shags with them, the Shags were not nesting there.

We noticed that when the Shag dives it jerks its body out of the water as it puts down its head, in order that the full weight of its body may be behind its shoulders, and so insure a deeper dive.

Far out at sea we saw, now and then, a Razorbill flying low over the waves, with much steady flapping of wings, followed by long gliding sweeps. One of them settled on the water near enough for us to see by the aid of the glass that it was certainly a Razorbill and not a Guillemot. The upturned tail and thicker bill identified it at once ; the white under parts extending up to the bill showed that it had adopted its winter plumage.

But the tide was now well up, and the flocks of waders were one by one leaving the rocks and flying off to some safer resting place, there to await the ebb. Now a flock of Oyster Catchers would go, now a group of Knots, and lastly, with evident reluctance, a little bunch of Turnstones. The Eiders too were on the move. They had gradually been drifting down the coast with the tide, and suddenly the whole flock took wing, and flew heavily but rapidly out to sea.

Continuing our way along the sandy beach we saw several flocks of Gulls sitting or standing in little groups, or paddling in the shallow water. Most of them were immature birds—Herring Gulls chiefly. As we approached they rose from the sand, running a few steps with necks outstretched and wings raised, to gain sufficient impetus to launch themselves into the air.

Arriving at the next reef, called the Greenhill rocks, we were just in time to see the last little flocks of Redshanks, Ringed Plover, and Turnstones take their departure as the incoming waves submerged their feeding grounds.

A bird floating just beyond the breakers here attracted our attention, and turning our glasses upon it we made it out to

be a Red-breasted Merganser. It was either a female bird, or a male that had not yet assumed the distinctive drake plumage, for its head, crest, and upper neck were chestnut brown, its lower neck greyish, under parts white, and back smoky brown, with a large white patch on the wing. The only other bird which it could possibly have been was a Goosander; but we had seen Goosanders, duck and drake, on the fresh-water lakes of Derwentwater and Bassenthwaite earlier in the year, so we were quite familiar with their appearance. This bird was too small and too dark in colour; besides there was a dark line across its white wing-bar which is not present on the wing of the Goosander. The bird dived actively, and we were rather interested to notice that when it came to the surface the feathers of its crest, which one would have expected to see clinging wet and bedraggled to the back of its neck, stuck out jauntily as if just freshly preened. Unfortunately it did not remain long for us to watch, but swam steadily out to sea.

We were disappointed in not having seen any Godwits—probably we were quite late enough in the season for them, and had we visited the larger mud-banks of Fenham Flats we should have come across them. We have on other occasions seen large numbers of them in Waren Bay, and that they do sometimes visit the beach near Bamburgh we discovered later, for on October 6th we met with a single bird not yet in full adult plumage feeding just on the edge of the advancing waves, plunging its long bill into the sand and extracting plump looking sand worms.

But it was now time for us to be going, so we turned our steps towards the little fishing hamlet of Seahouses—there to discuss our note books over a welcome cup of tea.

On some New Genera and Species of Thysanoptera

By Richard S. Bagnall, F.E.S.

(Plates VI. and VII.)

Although the Thysanoptera of Europe and North America have received special attention by Continental and American entomologists during the past fifteen years or more, the species of other countries and continents are almost entirely unknown. The order is a very interesting one, however, and is now beginning to attract the serious attention of several naturalists, so that our knowledge of the subject will, undoubtedly, be greatly increased during the next few years.

The present short contribution is one of many preliminary papers which I am at the present preparing, hoping when the Order has been reduced to a working basis to compile the volume on the Thysanoptera of the world for Wytsman's *Genera Insectorum*. I have thought it preferable to base this paper upon certain peculiar and, with few exceptions, large and strongly characterized species, the material of which I have drawn from collections and specimens kindly submitted to me by Mr. C. O. Waterhouse, British Museum; Professor Bouvier, Paris Museum; Mr. G. C. Champion (ex coll. Messrs. Godman and Salvin); Professor J. C. H. de Meyere, Amsterdam Museum, and Dr. H. Schouteden of Brussels. With the exception of the two very interesting species sent by Prof. de Meyere (*Machatothrips biuncinata* gen. et. sp. nov., and *Dinothrips sumatrensis* gen. et sp. nov.) all the specimens are unfortunately dried and carded, and are thus difficult to describe with satisfaction. I am also painfully aware of the many imperfections of my work and descriptions, and can only express regret that the time I am able to devote to the study of these interesting little insects is so very limited. For two reasons I have thought it desirable to hasten publication, firstly to draw the attention of other entomologists, both at home and abroad, to a most interesting but sadly neglected

group of insects, and secondly to secure a certain priority. Where possible I have made rough tables of the genera and species, and also drawings of the more important forms.

Ten new genera and eighteen new species are here described, but this is only a small portion of the material which has been so kindly and unreservedly placed in my hands by the gentlemen above-named, as well as by Dr. G. Horváth, National Hungarian Museum, Buda Pesth; Dr. F. Meinert, Copenhagen Museum, and Dr. D. Sharp, F.R.S. of Cambridge University. These latter three collections are of especial value and interest, and with the exception of the Hawaiian or last-named collection, the specimens are all preserved in alcohol. Each collection will form the subject of a separate memoir.

Although the known Thysanoptera do not yet number more than two hundred species, or thereabouts, it is very evident that the Order is in reality a large one, numbering probably well over a thousand species; it is also a group of wide distribution. Thrips (the name by which these insects are commonly known) should be searched for in the flowers, on the leaves and at the roots of various plants; on the leaves and in the flowers of trees; in galls; in turf; under bark of trees, etc.; and should always be collected into phials of 70 per cent. alcohol, the name of plant, habitat, etc., being noted. Special attention should be given to the collection of minute species, some of which measure only one-half a millimetre in length.

I would take this opportunity of expressing my gratitude to all those naturalists I have herein mentioned for the kindly help and encouragement they have given me.

Order THYSANOPTERA (Physapoda)

Sub-Order TEREBRANTIA Haliday

Family THRIPIDÆ Haliday

Genus APTEROTHRIPS* nov.

Head wider than long. *Eyes* slightly protruding. *Ocelli* absent. *Maxillary palpi* three-segmented. *Antennæ* eight-segmented, with the two-jointed style shorter than the sixth joint.

Prothorax as long as or a little longer than head, one short spine at each posterior angle with two subsidiary spines above same. *Wings* absent. *Legs* stout. Abdominal spines weak, no prominent spines at hind angles of intermediate segments. Anal spines comparatively long, slender.

Type—*Apterothrips subreticulata* mihi.

Easily recognised from the examples of the genus *Euthrips* Targioni-Tozzetti, by the absence of the two long spines at posterior angles of the prothorax, and also by the total absence of both ocelli and wings.

The genus is perhaps more closely allied to *Pachythrips* Uzel (type *P. subaptera* Hal.), but differs in the form of head, arrangement and modification of anal spines, and the entire absence of wings.

Apterothrips subreticulata sp. n. (Pl. VI., figs. 1–3).

Length 1.3 mm., breadth of mesothorax ·2 mm.

Colour dark brown, legs and antennæ lighter.

Head only slightly broader than long, frontal margin broadly and evenly rounded; hind surface irregularly wrinkled, forming a semi-reticulate sculpture at base of *cheeks*, which are widened below eyes; a series of minute spines across head immediately behind eyes, and still more minute spines between them. *Eyes* small, bulging slightly, very coarsely faceted,

* Aptero- =wingless.

the facets forming a conglomerate mass without apparent margin. *Ocelli* absent. *Mouth*-cone pointed; maxillary palpi three-segmented, the basal joint being the longest; labial palpi rather long. *Antennæ* one and three-quarter times as long as head, rather stout; inserted below frontal margin and only narrowly separated at base. First joint shortest, cylindrical; second constricted at base and slightly wider than any of the others; three to six subequal in width, three to five being broadly clavate and also subequal in length; sixth longest, cylindrical-ovate with a false division at apical fourth; style two-jointed and only one-half the length of the sixth joint.

Prothorax at least one and one-half times as broad as long, and scarcely, if any, longer than head; posterior angles broadly rounded, and each provided with one short curved spine and two minute lateral spines immediately above; each anterior angle with two short spines, one being slightly longer and stouter than the other and curved. Mesothorax as wide as prothorax, with projecting prominences at anterior angles; metathorax tapering but slightly posteriorly, with a moderately long and slender spine at each posterior angle, and similar spines at the anterior margin of metanotal plate. *Wings* absent. *Legs* stout, with the femora subreticulate as in head. Comparatively strong spines at the inner side of tip of each tibia.

Abdomen elongate-ovate, conical at apex; spines weak. Anal spines longer and stronger, though slender.

Type—In British Museum.

Hab.—Eight females, "Massett, Queen Charlotte Is. 1900–02."

Sub-Order TUBULIFERA Haliday

Family PHLŒOTHRIPIDÆ Uzel

The following three genera belong to a group of large and curious Thysanoptera apparently peculiar to the Malay Archipelago, and may be conditionally tabulated on the *male characteristics* alone as below.

Species large and massive; head with the cheeks profusely set with spines; prothorax more or less raised to posterior edge; wings invariably present.

I. *Size* larger (7–12 mm); *prothorax* strongly raised to posterior edge; *fore-femora* simple or with but a single broadly seated blunt tooth at the base within, and each *fore-tarsus* armed with a single long and broad tooth:

a. *Prothorax* strongly sculptured; *fore-coxa* produced in the form of a simple, curved or geniculate horn; anterior angles of *mesosternum* simple.

Genus **Macrothrips** Bagnall

b. *Prothorax* smooth and shining; *fore-coxa* simple; each anterior angle of *mesosternum* with a peculiar lateral bifurcate projection.

Genus **Dinothrips** nov.

II. *Size* smaller (less than 7·0 mm.); *prothorax* slightly raised to posterior edge; each *fore-femur* within armed with a series of long acute teeth, and each *fore-tarsus* with two small spurs.

Genus **Machatothrips** nov.

Genus MACROTHRIPS Bagnall

Table of species:—

I. *Size* larger (10-12 mm.); *fore-femora* each with a large broadly seated blunt tooth at the base within; *fore-coxa* abnormally produced:

a. *Head* longer, with a strong backwardly and laterally curved spine-set protuberance behind each eye; *fore-coxa* produced in the form of an elbowed or geniculate horn; *fore-legs* more massive: *fore-tibiæ* each with a strong thorn-like tooth at apex within and another a little behind apex; *tube* three times the length of the ninth abdominal segment.

papuensis Bagnall

b. *Head* shorter and stouter; *post-ocular* protuberance obsolete; *fore-coxal* projection not geniculate but curved forward; *fore-tibia* with pair of small teeth (side by side) before the apex within; *tube* four times the length of the ninth abdominal segment.

intermedia sp. nov.

II. *Size* smaller (7 mm); *fore-femora* simple and *fore-coxæ* simply produced. **dubia** Bagnall

The three known species are from New Guinea.

Macrothrips papuensis Bagnall* (Pl. VI., fig. 4).

Through the kindness of Prof. Bouvier, Paris, I have had the pleasure of examining a small collection of Thysanoptera containing two examples of this species, which was unfortunately described from an incomplete specimen. The *mouth-cone* is longer than the breadth at base and ends in a blunt point. The basal joint of maxillary palpus is rather long (·07 mm.), whilst the second joint is comparatively stout and only a little more than twice the length of the first joint (·15 mm.), and is tipped with one long and two shorter filaments.

The tube is three times the length of the ninth abdominal segment, whilst the hairs of the latter are extremely long (1·68 mm.), being one and three-quarter times the length of the tube (·96 mm.).

In a specimen of recent capture the tooth of the fore-femur is protected by a number of short stout spines.

Hab.—New Guinea, one ♂ (*Raffrey* and *Maindron*, 1878); one ♂, Humboldt or Dorey (*C. H. Pasteur*, 1906), Paris Museum.

Macrothrips intermedia sp. n.

Length 10 mm.; breadth of mesothorax about 2·0 mm.

Intermediate between *M. papuensis* Bagnall, and *M. dubia* Bagnall, very closely resembling the first-named in general form. The *head* is shorter, stouter, and more depressed than in *M. papuensis*, being less than twice as long as broad; the post-ocular protuberance is obsolete; the spines are shorter and stouter; the ocelli are much smaller, and the posterior pair is placed *above* a line drawn across the anterior margin of eyes.

The *prothorax* is less distinctly channeled; the fore-coxal projection is only slightly curved forward and not geniculate or elbowed. Each fore-femur (smaller than in *M. papuensis*, but much larger, comparatively, than in *M. dubia*) is not so profusely covered with long hairs, but has the same strong,

* Ann. and Mag. of Nat. History, ser. 8, vol. i., pp. 355–363, pl. xiv. and xv.

broadly seated tooth as in *M. papuensis*, the apical part pointing more directly forward. Anterior tibiæ each armed with a pair of comparatively small teeth side by side, shortly before the apex within, and a series of minute teeth between the apex and the principal teeth; tarsal tooth very long and narrow. The *wings* reach to the apex of the fifth abdominal segment, whilst the *tube* is long, being four times the length of the ninth abdominal segment and about one and one-third times the length of the head.

Type—In coll. Bagnall by the kindness of Dr. Schouteden, Brussels.

Hab.—Friedrich-Wilhelmshafen, German New Guinea, one male (?).

Genus MACHATOTHRIPS* nov.

Head longer than its breadth or than the length of the prothorax. *Cheeks* set with a few short spines. *Eyes* medium sized. *Ocelli* present. *Antennæ* . . . *Mouth-cone* about as long as its breadth at base, and ending in a comparatively sharp point.

Prothorax simple; anterior coxæ large but simple; femora swollen, and each armed with a series of long sharp teeth from the centre to apex within; each tarsus armed with two small spurs. *Wings* present.

Abdomen long and comparatively heavy.

Species large.

Type—*Machatothrips biuncinata* mihi.

Machatothrips biuncinata sp. n. (Pl. VI., figs. 5, 6).

Length 6·2 mm.; width of mesothorax 0·9 mm.

General *colour* brownish black, unicolorous.

Head one and one-third times as long as width of *cheeks*, which are slightly swollen at basal third and unequally set with short stout spines. *Eyes* medium in size, finely faceted; space between them one and one-half the width of each eye. *Ocelli* not large, posterior pair on a line with centre of eyes

* Machato- =warrior

but remote from their margins. Post-ocular and dorsal spines long. *Antennæ* broken in the type, basal joints not approximate. *Mouth-cone* rather long and slender, and ending bluntly; second joint of maxillary palpus long and rather stout, four times the length of basal joint.

Prothorax widening gradually to base, only slightly raised to the posterior edge, near which there is a strong transverse impression or channel. Anterior-marginal spines obsolete, posterior-marginal, mid-lateral and spines at angles present. Anterior coxa large with one conspicuous spine; femur swollen and armed with a series of acute teeth at the anterior half of the inner edge. The first and longest tooth is situated at about the mid-line, and is followed apically by three smaller teeth each less than the one preceding in size, the fourth tooth being followed by a minutely serrate edge. The fore-tibia is comparatively long, slightly swollen opposite the principal tooth, and roughened in such a way as to suggest a stridulating surface. Above the main fore-tarsal tooth there is a second and slenderer spur, this important character suggesting the specific name *biuncinata*. *Pterothorax* broader than the width across the fore-coxæ, and broader than long. Posterior and intermediate legs long and slender, sparsely covered with slender spines. *Wings* coriaceous, reaching to seventh abdominal segment.

Abdomen long, about three-quarters the length of the whole insect; narrowing gradually from the sixth segment to tube. *Tube* long (0·7 mm.), and nearly three times as wide at base (0·2 mm.) as at apex (0·072 mm.). Terminal hairs comparatively long and abdominal spines stout.

Type—One male in the Amsterdam Museum.

Hab.—South New Guinea (Netherlands' New Guinea Expedition, 1904–5).

Genus DINOTHRIPS* nov.

Head not quite twice as long as broad, and slightly longer than the prothorax; *cheeks* set with several strong spines.

* Dino- =terrible.

Eyes medium in size. *Ocelli* present. *Antennæ* more than twice the length of head, with the intermediate joints much elongated and sense-cones moderately long and stout. *Mouth-cone* longer than breadth at base, but not reaching to base of prosternum.

Prothorax abruptly raised to posterior edge, thus throwing disc into a vertical position; smooth and shining; a strong spine-set wart at each posterior angle. Anterior coxæ small and simple; anterior femora and tibiæ strongly set with stout spines; tarsi each with a long stout tooth. Each anterior angle of mesothorax armed with a projecting chitinous plate, widened and divided in the form of two pointed blades. *Wings* present.

Abdomen long and heavy.

Species large.

Type—*Dinothrips sumatrensis* mihi.

These characters are drawn from the male. Specimens apparently of the female sex differ especially in the form of prothorax, which is depressed and differently sculptured, and in the absence of the mesosternal projections. Prof. J. C. H. de Meyere, Amsterdam, has kindly presented me with a good series of the type species as well as with material in the larval and pupal stages, and I therefore hope, with Mr. Gill's kindly help and collaboration, to prepare a special study of this peculiar creature.

Dinothrips sumatrensis sp. n. (Pl. VI., fig. 7).

♂. Length 8·0 mm.; breadth of mesothorax 1·0 mm., excluding projections.

General *colour* coal black, all tarsi brownish, a band of yellow encircling central part of third antennal joint.

Head one and two-thirds times the length of breadth. *Cheeks* profusely covered with spines. *Eyes* moderate in size and finely faceted. *Ocelli* large, the anterior ocellus with a strong spine on each side. *Mouth-cone* shorter than the width at base. *Antennæ* twice the length of the head, separated at

base. All joints elongated; joints three to six roughly claviform; seven and eight fusiform. Third joint more than four times the length of the second, with the stem thickened; fourth four-fifths of third; fifth slightly shorter than the fourth; sixth three-quarters of fifth and narrower; seventh one-half of sixth, and apical two-thirds of penultimate. Hairs fine, black. *Sense-cones* comparatively long and acute, especially those on third joint.

Prothorax convex, shining; strongly raised to posterior edge, and with a shallow channel down centre; tubercle near each hind angle set with two long bristles. Fore-legs greatly enlarged; coxa with one particularly conspicuous spine; femur enlarged, strongly set with bristles; tibia very broad, and tarsal tooth long and broad. *Pterothorax* as broad as the width across fore-coxæ; anterior angles of mesosternum with a peculiar bifurcate chitinous plate projecting laterally. Intermediate and posterior legs comparatively long, and each intermediate femur with a large forwardly directed tubercle at the base within. *Wings* long, coriaceous, and heavily fringed.

Abdomen long, tapering to tube; segments more or less elongate. *Tube* long, gradually narrowed from base to apex; as long as the head and two and a half times the length of the ninth abdominal segment. Terminal hairs two-thirds the length of tube, and bristles of the ninth abdominal segment longer than tube. Abdominal spines long.

♀. This sex differs from the male more particularly in the smaller size; the fore-legs which are not so greatly enlarged; the form of prothorax; the absence of mesosternal projections and of the tubercle on the inner side of each intermediate femur; the broader abdomen, and other details which I hope to particularise in a future paper.

Type—Amsterdam Museum.

Hab.—Several examples of both sexes and in all stages, Sumatra. There are also three carded males in the Paris Museum, Benghalis, Sumatra (*Maindron*, 1885).

The following six genera, some of which are of an anomalous character, may be separated as follows :—

I. *Wings* and *ocelli* absent. Genus **Leurothrips** nov.

II. *Wings* and *ocelli* present :

A. *Head* longer, more or less cylindrical ; *sensory filaments* of antennæ abnormally developed. Genus **Eupathithrips** nov.

B. *Head* shorter, not cylindrical ; antennal *sense-cones* normal :

1. *Head* longer than prothorax ; *prothorax* not greatly enlarged:

a. *Head* greatly swollen behind eyes ; *ocelli* not equidistant. Genus **Docessissophothrips** nov.

b. *Head* depressed ; *ocelli* equidistant :

i. Front margin of head truncate ; anterior ocellus set in centre of forehead and protected by two forwardly directed spines ; cheeks with spines not set in warts ; abdominal bristles exceedingly long. Genus **Diceratothrips** nov.

ii. Front margin of head more or less rounded ; all ocelli dorsally visible ; cheeks with spine-set warts ; abdominal bristles not exceptionally long. Genus **Phlœothrips** Haliday.

2. *Head* shorter than prothorax ; *prothorax* greatly enlarged, more than twice as long and three to four times as broad as the head. Genus **Eurynothrips** nov.

Genus DICERATOTHRIPS* nov.

Head not narrowed in front, longer than its breadth and than the length of prothorax. *Cheeks* set with a few spines which are not set in warts. Front margin of head truncate. *Eyes* small. *Ocelli* present; posterior pair widely separated ; anterior one set in the centre of forehead, looking forward, and protected by two rather long spines set directly forwards, which have the appearance of a pair of horns. *Antennæ* set well below the vertex and eyes ; about twice the length of head, and with the intermediate segments elongate. *Fore-femora* thickened, and tarsi armed. *Wings* long.

Abdomen about as broad as the mesothorax ; *tube* stout, and longer than head. Abdominal spines or hairs extremely long.

Species medium sized.

Type—*Diceratothrips bicornis* mihi.

* Dicerato- =two-horned

Diceratothrips bicornis sp. n. (Pl. VI., figs. 8, 9).

Length 3·4 mm.; breadth of mesothorax 0·7 mm.

Colour uniform black, second antennal joint brownish.

Head with anterior margin truncate, one-fifth longer than broad and one-fifth longer than the prothorax. *Cheeks* straight and practically parallel, set with a few small, slender spines which are not mounted on tubercles; surface finely (and apparently cross-) striate, shining. *Eyes* small and comparatively finely faceted; space between them twice the width of one of them; post-ocular spines long. *Ocelli* comparatively large; posterior pair set on a line with centre of eyes and close to their margins; anterior one set in centre of forehead, looking forward and protected by a pair of forwardly directed and rather long spines set close to the apical margins of eyes. *Antennæ* separated at base; inserted under vertex and twice the length of head. First joint concealed at base, cylindrical; second elongate, narrowed at base; three to five claviform; six to eight fusiform. Third joint three times the length of the second; fourth five-sixths of third; fifth four-fifths of fourth; sixth about three-quarters of fifth and of the two apical joints together; apical joint short and pointed, one-third the length of penultimate. *Sense-cones* not long; acute and light coloured; hairs dark.

Prothorax nearly twice as broad at base as long; broadly widened from anterior margin to basal third, and from thence more or less parallel. Spines at posterior angles very long and set in tubercles; posterior-marginal spines and those at anterior angles short. Surface finely reticulate, raised to posterior edge, with a transverse depression at base, and a deep transverse discal channel or cicatrix in the form of a low broad W. Fore-coxa with one conspicuous spine; fore-femora set with a few short and rather stout spines on the inner and outer edges, and two or three long and slender ones on outer edge; fore-tibia with short slender spines and one very long bristle just below knee; each fore-tarsus armed with a small tooth. Hind and intermediate legs rather long and comparatively slender, armed with short slender spines, as well as longer ones

just below each knee and protecting each tarsus. *Pterothorax* closely connected with prothorax, as wide as the width across fore-coxæ. *Wings* long, reaching to the ninth abdominal segment; coriaceous, with long brownish cilia, irridescent and of a hyaline appearance; top pair with a smoky tinge towards base. *Abdomen* apparently no broader than pterothorax; parallel to sixth segment, and from thence narrowing to base of tube. *Tube* about one-third longer than head, two and a half times broader at base than at apex; very gradually narrowed to apical third, and from thence rapidly converging to apex; terminal hairs weak and only about three-eighths the length of tube. Abdominal hairs or bristles extremely long, especially the lateral ones; those at apex of ninth segment the longest, longer than tube.

Type—In British Museum.

Hab.—Santarem. There are three towns of that name, one each in the States of Para and Bahia, Brazil, and the third in Portugal. This species is presumably Brazilian.

Genus PHLŒOTHRIPS Haliday

Phlœothrips spinipes sp. n. (Pl. VI., fig. 10).

Length 2·35 mm.; breadth of mesothorax 0·45 mm.

General colour uniform chestnut brown. *Antennæ* (with the exception of the two basal joints) and all tibiæ and tarsi yellow.

Head about one and one-quarter times as long as wide. *Cheeks* only slightly curved, bulging behind eyes and gradually converging posteriorly; set with a few minute spines borne on small tubercles. *Eyes* medium sized, moderately finely faceted. *Ocelli* large, set on an elevation; yellowish red in colour; posterior pair set on a line with centre of eyes but remote from their margins. *Antennæ* approximate at base, long and slender, twice as long as head; joint three broadly claviform; four and five claviform but narrower; six to eight fusiform: joints three to five about subequal; sixth four-fifths of fifth, and seventh three-quarters of sixth.

Prothorax one and four-fifths as wide at base as long, slightly convex and smoothly widened at base; frontal edge margined and broadly emarginate. Posterior coxæ armed with three stout and conspicuous spines; femora swollen and studded with a number of small spine-set warts, and with a group of stronger spines at the outer edge of each near base; tarsal tooth prominent. *Pterothorax* almost square, not quite so wide as width across fore-coxæ; mesothorax closely joined to prothorax. Intermediate and posterior legs long; femora slightly swollen, and each armed with a row of strong and rather long spines on the upper edge. *Wings* only reaching to the seventh abdominal segment.

Abdomen about twice the breadth of head, oblong-ovate, eighth and ninth segments tapering abruptly to tube. *Tube* less than two-thirds the length of head, twice as broad at base as at apex, sides straight. Abdominal spines comparatively long and knobbed.

Type—In British Museum (ex. coll. Saunders).

Hab.—Dorey, New Guinea (*Wallace*).

Genus LEUROTHRIPS* nov.

Head at least twice as long as the width immediately behind eyes. *Cheeks* swollen, widest at posterior third. *Eyes* small. *Ocelli* wanting. *Antennæ* as long as head, comparatively stout. *Mouth-cone* shorter than its breadth at base, not reaching to base of prosternum; labrum blunt.

Prothorax only slightly wider than head. *Legs* long; fore-femora only slightly enlarged; fore-tarsi armed. *Wings* absent. *Abdomen* flat.

Species of medium size.

Type—*Leurothrips albomaculata* mihi.

Table of species :—

I. Size larger; *head* three times the length of *prothorax*; *abdomen* ovate, black with white markings.
albomaculata sp. nov.

II. Size smaller; *head* twice the length of *prothorax*; *abdomen* linear, unicolorous, black. **linearis** sp. nov.

* Leuro- =flat.

Leurothrips albomaculata sp. n. (Pl. VI., figs. 11, 12)*.

Length 3 mm.; breadth of mesothorax about 0·45 mm.; greatest breadth of abdomen 0·9 mm.

Colour coal-black, a white irregular band across the first dorsally visible abdominal segment and a white patch on each side of segment five at the extreme edge. Third antennal joint and part of fourth yellow, all tarsi brown.

Head large, transversely striate, reticulate near base; gradually widening behind eyes to posterior third (where the head is swollen dorsally as well as laterally), and then as gradually converging towards neck; three times as long as prothorax and almost as wide; vertex raised and produced to a point which separates basal joints of antennæ. *Eyes* rather small and moderately finely faceted, not prominent. *Ocelli* absent. *Mouth-cone* comparatively blunt; maxillary palpi with the second joint narrower than and more than twice the length of the first joint. *Antennæ* but slightly longer than head, separated at bases with a projection between them; intermediate joints each furnished with a pair of *sense-cones*. Joints three to six claviform, seven and eight fusiform; third joint one and one-half times the length of basal joints together, and nearly twice the length of the fourth; fifth and sixth about one-sixth shorter than the fourth and fifth respectively, and the penultimate and apical joints together equal to the sixth. Basal joint black; second black shaded to brown at the apex; third and fourth yellow marked with brown at the apices; fifth to eighth dark brown.

Prothorax one-third the length of head and a little broader than long; convex; roughly reticulate. Anterior coxæ comparatively large, armed with one small spine. *Pterothorax* almost square, very slightly wider than prothorax, and wavily reticulate; meso- and metasternum equal in breadth, sides of the latter being straight and parallel. *Wings* absent. *Legs* long and stout; fore-femora only slightly thickened, and the tarsi each armed with a small tooth; small and inconspicuous hairs on the outer and inner surfaces of all femora and tibiæ, with longer protective hairs at the apex of each tibia.

* = *Phlœothrips albosignata* Reuter—see Addendum.

Abdomen broad and flat, only twice the length of head and nearly twice as broad as the pterothorax; almost parallel from the third to the sixth segment, and from thence curving smoothly to base of tube, the ninth segment being very small. *Tube* less than a third the length of head. Spines on abdomen very small and inconspicuous, longest from the sixth segment, the longest and stoutest springing from the apex of the ninth segment. Terminal hairs of tube short. Distinct traces of wing-retaining spines, though the species is apterous. The dorsal surface of each abdominal segment is strongly reticulate, the strongest network showing at the base of each.

Type—British Museum (ex coll. Pascoe).

Hab.—Two unlabelled specimens.*

Leurothrips linearis sp. n.

Length 2·4 mm.; breadth of mesothorax 0·45 mm.; greatest breadth of abdomen 0·52 mm.

General structure as in the preceding species.

Colour coal black; tarsi brownish-black; antennal joints (except the basal joint) yellow.

Head short, only twice the length of prothorax, and not twice as long as its breadth at base. *Eyes* rather small. *Antennæ* as in *L. albomaculata*, not quite one and one-half times the length of head; third joint only one quarter longer than the two basal joints together, and also one and one quarter times as long as the fourth joint; fifth two-thirds of fourth and about one-sixth shorter than the sixth, and equal to the penultimate and apical joints together; apical joint very small.

Prothorax wider than head; mid-lateral, posterior- and anterior-marginal spines and spines at angles strong, those at posterior angles being especially long. *Pterothorax* nearly square, being very slightly broader than long; mesosternum more than twice the width of head at base, sides parallel; metasternum not so broad, and with sides evenly rounded.

* There are five specimens referable to this species in the Dublin Museum, labelled "Algeria, *Rippon*."

Fore-tarsal tooth minute. *Abdomen* flat and linear; five times the length of head and only about one and one-eighth as broad as the prothorax; slightly widened to the third segment from base, and smoothly narrowed from the sixth segment to the ninth, which is very small. *Tube* about one-half the length of head. Terminal hairs and spines almost as in *L. albomaculata*.

Type—Paris Museum.

Hab.—Two specimens, Sardilla, Grande Canarie (*Ch. Alluaud*, 1900).

Genus EURYNOTHRIPS* nov.

Head as long as or only slightly longer than width at base. *Antennæ* about twice the length of head. *Mouth-cone* long and slender, longer than breadth at base, but not nearly reaching base of prosternum.

Prothorax in the form of a large expanded hood, between three and four times the width of head, and more than twice as long; broadest behind the mid-line, and rapidly and evenly narrowed to base of head. *Pterothorax* and *abdomen* narrower than prothorax. *Fore-legs* enlarged in both sexes and tarsi strongly armed. *Wings* present.

Species medium sized.

Type—*Eurynothrips magnicollis* mihi.

The species may be tabulated as follows :—

I. *Head* not strongly constricted behind eyes; *prothorax* more depressed, only slightly wider than mesothorax, and without teeth at lateral angles. **magnicollis** sp. nov.

II. *Head* strongly constricted behind eyes; *prothorax* more convex, decidedly wider than mesothorax, and with a minute tooth at each lateral angle. **denticollis** sp. nov.

Eurynothrips magnicollis sp. n. (Pl. VI., figs. 13, 14).

Length 3·2 mm.; length of prothorax ·825 mm.; breadth of prothorax ·665 mm.; breadth of mesothorax ·6125 mm.

Colour dark chestnut brown; antennæ, all tarsi, fore-tibiæ, and apices of fore-femora testaceous yellow.

* Euryno- (Eurynoto-) =broad-backed.

Head small, slightly rounded in front; transversely striate, reticulate near base; only a little more than one-half the length and slightly more than one-third the breadth of prothorax, and only one-ninth longer than broad. *Cheeks* more or less parallel. *Eyes* moderate, finely faceted; post-ocular spines not conspicuous; inner margin of eyes parallel, and space between them one-third wider than width of eye. *Ocelli* moderately large, set well forward and widely separated; posterior pair near margins of eyes, and the anterior one at the extreme vertex of head. *Antennæ* inserted below vertex; testaceous yellow, basal joint fuscus; twice the length of head and rather stout. Third and fourth joints broadly claviform; joints five to seven each similar in shape, length and breadth; apical joint narrower, and two-thirds the length of penultimate. *Mouth-cone* much longer than the breadth at base, long and pointed, but not reaching beyond the middle of prosternum; labial palpi long; maxillary palpi also long, with two of the sensory filaments longer than the apical joint.

Prothorax convex but somewhat depressed, very large and expanded; narrowed rapidly to apex from posterior third, and upper surface narrowed to base from the same point. Spines at posterior angles long; those above lateral angles at posterior third not so long; posterior-marginal spines and those at anterior angles small; anterior-marginal spines apparently obsolete. Fore-coxa large with one long lateral spine; fore-femur very broad, at least as broad as head. Each fore-tibia broadened and depressed, furnished with several long bristles on the inner margin, one near apex being exceptionally long. Tarsal tooth acute, broad at base and extremely long. *Pterothorax* very slightly narrower than prothorax; metathorax narrowing posteriorly. Intermediate and posterior legs rather long, with the femora slightly thickened. *Wings* reaching to seventh abdominal segment, rather slender; of a testaceous colour, and with long smoke-tinged cilia.

Abdomen as wide as pterothorax, narrowly rounded from seventh segment to tube. *Tube* about one-eighth longer than head, twice the breadth of apex at base, and with the surface

sparingly furnished with minute white setæ; terminal hairs longer than tube. Abdominal spines long and knobbed.

Type—In British Museum.

Hab.—Several specimens, Queensland (1902–319, *F. P. Dodd*).

Eurynothrips denticollis sp. n. (Pl. VI., fig. 15).

Length 3·75 mm.; length of prothorax 0·78 mm.; breadth of prothorax 1·0 mm.; breadth of mesothorax ·75 mm.

Resembling *Eurynothrips magnicollis* mihi in general structure.

The *head* is not quite one-third the length of the prothorax and one-third the width; the *eyes* appear to be more rounded dorso-laterally; the *cheeks* are constricted sharply to middle and there acutely widened, here differing from any described species of thrips (see figure); whilst there is a slight swelling at base of head. The antennæ are more than twice the length of head, whilst the joints three to six are distinctly claviform and more elongated.

The *prothorax* is larger, not depressed (*i.e.* more strongly convex), surface more finely reticulate and shining; the lateral angle comes nearer the mid-line than the posterior third, and in consequence of this, as well as of the less length and greater breadth, the prothorax is more strongly narrowed to base of head. There is a minute distinctive tooth at each of these lateral angles which suggests the specific name *denticollis*. *E. denticollis* is also larger than *E. magnicollis*, and the prothorax is comparatively broader, being decidedly broader than the pterothorax.

Type—In British Museum.

Hab.—Two specimens, Townsville, Queensland (14–7–02, 1902–319, *F. P. Dodd*).

Genus DOCESSISSOPHOTHRIPS* nov.

Head large, greatly swollen behind the eyes, both dorsally and laterally. *Eyes* small, widely separated. *Ocelli* comparatively large, not equidistant, the posterior pair being

* Docessissopho- =conceited in his own eyes (in reference to the peculiarly swollen head).

widely separated. *Cheeks* sparingly set with small spines set in minute warts. *Antennæ* . . . . *Mouth-cone* . . .

Prothorax one-third the length of head, irregularly but strongly transverse. *Fore-femora* swollen; tarsi fairly strongly armed; hind and intermediate legs long. *Wings* present.

Species medium sized.

Type—*Docessissophothrips ampliceps* mihi.

At once recognised by the striking form of the head. The type specimen is unfortunately badly mounted, the gum covering the tube and wings, the abdomen dried and curled, and the antennæ, with the exception of the two basal joints, broken off.

Docessissophothrips ampliceps sp. n. (Pl. VI., figs. 16, 17).

Length 2·6 mm.; breadth of mesothorax 0·6 mm.

Colour reddish-brown; tarsi and antennæ lighter. Intermediate and the hind coxæ white with slight traces of reddish pigmentation. *Head* strongly raised and swollen above and behind eyes, and constricted both laterally and dorsally towards neck. *Cheeks* set with a few small spines. *Eyes* small, finely faceted and widely separated, having chiefly a lateral range of vision. *Ocelli* comparatively large, light red; posterior pair widely separated, though remote from the inner margins of eyes; post-ocular spines apparently absent. *Surface* of head roughly striate, reticulate laterally towards base.

Prothorax strongly transverse, irregularly margined; two crescentic ridges near the anterior margin and meeting in centre, and two similar but obverse crescentic ridges before the posterior margin, enclosing a pair of thumb-like impressions. *Surface* irregularly reticulate. Mid-lateral, anterior- and posterior-marginal spines, as well as those at posterior angles long and stout; spine at each anterior angle short. *Pterothorax* as wide as the width across fore-coxæ. Fore-femora swollen, furnished with a few minute warts; fore-tibia broad, and fore-tarsus armed with a short broad tooth. Intermediate and posterior legs long, with the femora slightly

swollen. *Wings* reaching beyond apex of tube, brown in colour, coriaceous and heavily fringed.

Abdomen apparently ovate and wider than the pterothorax, with moderately long spines.

Type—One specimen in coll. Godman and Salvin.

Hab.—Orizaba (H.S. & F.D.G., Dec., 1887).

Genus EUPATHITHRIPS* nov.

Head about one and one-half times the length of prothorax, and more than three times as long as the width at base. *Cheeks* slightly swollen, set with a lateral series of small spine-set warts. *Eyes* large and prominent. *Ocelli* rather large, and set on a slight elevation. *Antennæ* longer than head. *Sense-cones* extremely long and acute, each protected by a long and slender bristle or accessory cone, the joints bearing these organs being much swollen. *Mouth-cone* long and slender, reaching to base of prosternum.

Base of *prothorax* nearly three times as wide as the head at base, strongly narrowed to anterior margin. *Fore-coxæ* prominent, and each armed with one conspicuous spine; femora long and swollen, and each tibia with a double row of small teeth on the inner edge; tarsus armed with a small tooth. *Wings* present. Intermediate and posterior legs rather long and slender. *Abdomen* slightly broader than prothorax, with abdominal spines more than usually long.

Species of medium size.

Type—*Eupathithrips dentipes* mihi.

This genus is at once distinguished by the highly developed antennal organs, and further differs from any other described form of Thysanoptera in the character of the anterior tibiæ, each of which is armed with a double row of small teeth for the whole length of the inner margin. The mouth characters agree to a remarkable extent with those of *Poecilothrips* Uzel (type *P. albopicta* Uzel); otherwise the species is of a somewhat anomalous character, and must only be regarded as belonging to the *Phlœothripidæ* provisionally.

* Eupathi- =very sensitive.

Eupathithrips dentipes sp. n. (Pl. VII., figs. 1–4).

Length 5·2 mm.; breadth of mesothorax 1 mm.

Colour uniform, dark reddish-brown; antennæ, tibiæ, and tarsi lighter, and apical angles of abdominal segments reddish-yellow.

Head more or less cylindrical, three times as long as the greatest breadth of cheeks, narrower behind eyes, but filling out gradually and narrowing again before base. *Cheeks* widest at about posterior third, and set with a series of small spine-set warts. *Eyes* large, finely faceted, bulging laterally and extending decidedly further on the upper than on the underside. *Ocelli* also large, posterior pair on a line with centre of eyes, close to their margins and on the edge of a slight elevation. *Antennæ* approximate at their bases, set beneath the vertex; basal joint cylindrical; second slightly narrowed at base; third to sixth roughly claviform, and seventh and eighth fusiform. Joint four is a little shorter than the third; fifth four-fifths of fourth, and sixth only one-half of the preceding. The *sense-cones* offer one of the most striking features of this strongly characterized creature; they are simple, slender, and extremely long, each being two-thirds the length of the segment from which it springs. The highly developed state of these organs is further emphasized by the fact that each of the intermediate antennal joints is much swollen for their reception, and then abruptly reduced before apex, the sense-cones being seated on the frontal face of the widest part. So far as I can make out there are three cones on each of joints three and four, and two only on five and six. Each cone is protected on the outer edge by what appears to be an accessory or secondary sense-organ of similar shape, but slenderer and not quite so long; these secondary organs may quite possibly be specially modified protective spines, though from the single preparation I have been able to make I am inclined to believe the first-named view to be correct, namely, that they are true sensory filaments of a secondary character. No such organs have, however, previously been described in the Thysanoptera. Each of

these intermediate joints is further furnished with a series of bristles or stout hairs encircling it immediately below the swollen part as well as with a few shorter hairs on the contracted part near apex.

Mouth-cone with the labrum long and slender, reaching to base of prosternum; maxillary palpus with the second joint extremely long and slender, tipped with four hairs.

Prothorax strongly convex, about two-thirds the length of head, widened strongly to base, where it is three times the width of the head at base; surface smooth and shining. Anterior-marginal and mid-lateral spines wanting; a comparatively long spine, however, near each posterior angle. Anterior coxa armed with a similar spine. *Pterothorax* much longer than broad, wider than prothorax; metasternum reticulate, laterally rounded, narrowed posteriorly and armed with a single spine at base. *Wings* reaching to ninth abdominal segment, very strongly fringed. *Legs* long, posterior and intermediate pairs covered with long stout hairs; fore-femora much enlarged, smooth, and shining, the outer margin bearing, near base, a few small forwardly directed bristles set in minute warts; fore-tibia almost cylindrical, armed for the whole length of the inner edge with a double row of small spine-set teeth, set at a slightly forward angle, and tarsus armed with a small tooth.

Abdomen about one-half the length of the whole insect, as broad as pterothorax, and narrowing smoothly to tube from the seventh segment. *Tube* scarcely two-thirds the length of head, terminal hairs moderately long. Abdominal spines long and slender, the wing-retaining bristles being more than usually long. Surface very finely reticulate.

Type—One male (?) in coll. Godman and Salvin.

Hab.—Guatemala (ex "Salle coll.").

Family IDOLOTHRIPIDÆ Bagnall

In a recent paper entitled "Studies on Australian Thysanoptera: The genus *Idolothrips* Haliday," Mr. W. L.

Froggatt*, Government Entomologist, gives an interesting account of the life history of *Idolothrips spectrum* Haliday. In the preface, however, Mr. Froggatt states that from the study of a large quantity of material it is evident to him that Haliday described the two sexes as distinct species, and a smaller and more variable form of the male as a third. He writes the synonymy thus :—*Idolothrips spectrum* Hal. (♂), = *marginata* Hal. (♀), = *lacertina* Hal. (♂).

Knowing Haliday's discriminative powers in groups of minute and infinitely more difficult insects, and referring to his original descriptions, I am inclined to believe that two *at least* of his species are valid. Haliday† divided the genus into two divisions thus :—

A. Abdomen segmentis posterioribus tam longitudinis quam latitudinis ratione decrescentibus, lateribus fere muticum.

AA. Abdomen longissimun, segmentis penultimis oblongis, lateribus denticulatum, tubulo basi gibbulo et muricato.

I. marginata is placed in the first division, and *spectrum* and *lacertina* in the second. Whilst not wishing to make any statements before an actual examination of the types has been made, I am convinced that *I. marginata* is not only specifically but generically distinct from the species of the second division. Though making such assertions, Froggatt brings nothing whatever forward to support his views, nor does he, when describing the imago, describe the female sex but only the male, which would seem to suggest that he only knew the male and was not therefore in a position to state that Haliday's *I. marginata* was the female of *I. spectrum*. Therefore the two species thus reduced to synonyms should, I think, be reinstated until something more definite can be said about them. The division of which *Idolothrips* is the typical genus is apparently a large group both in genera and species, and one of wide distribution.

* Proceedings Linnæan Society of New South Wales, 1904, Part I., pp. 54–57, pl. iii.

† "List Homoptera in coll. British Museum," Walker, Part IV., p. 1096, Physapoda.

The genera may be provisionally tabulated as under :—

I. Abdominal segments two to eight each armed laterally with a strong tooth. Genus **Acanthinothrips** nov.

II. Abdominal segments simple :

A. *Head* greatly produced beyond the eyes ; each anterior *prothoracic* angle in the form of a recurved horn ; *fore-femora* armed ; *tube* shorter than the ninth abdominal segment. Genus **Mecynothrips** Bagnall

B. *Head* not, or only slightly, produced beyond the eyes ; *prothorax* and *fore-femora* simple ; *tube* longer than the ninth abdominal segment :

i. *Head* shorter ; *cheeks* not set with spines ; *prothorax* strongly transverse, neither tuberculate or sculptured; *tube* four times the length of the ninth abdominal segment. Genus **Panurothrips** nov.

ii. *Head* longer ; *cheeks* more or less strongly set with spines ; *prothorax* tuberculate or sculptured ; *tube* less than four times the length of ninth abdominal segment. Genus **Idolothrips** Haliday

Genus ACANTHINOTHRIPS* nov. (Pl. VI., figs. 5–6).

Head more or less cylindrical, three times as long as the prothorax, but not quite three times the length of its breadth ; not greatly produced beyond eyes. *Cheeks* slightly swollen at base, set with spines. *Eyes* large. *Antennæ* very long and slender, three times the length of head. *Prothorax* simple. *Legs* long and slender ; all coxæ projecting. *Wings* present. *Abdomen* very long and narrow ; second to eighth segments armed at each side with a stout backwardly curved tooth, the pair on segment eight being the longest and stoutest ; ninth segment short, armed at apex with a series of short, stout spines. *Tube* very long, not strictly cylindrical, six times the length of the ninth segment, twelve or more times as long as broad, and twice the length of the head.

Species large, up to 12 mm.

Type—*Acanthinothrips (Idolothrips) spectrum* Haliday.

Hab.—Australia. Described by Haliday on specimens collected by Darwin, and since recorded from New South Wales, Queensland, Tasmania, and Victoria.

One specimen in the British Museum.

* Acanthino- =thorny.

Genus PANUROTHRIPS* nov.

Head more or less cylindrical, three times as long as the prothorax, and about three times the length of its breadth; fore part not produced beyond eyes; vertex elevated and bearing anterior ocellus at the extreme apex. *Cheeks* parallel and not set with spine-bearing warts. *Eyes* comparatively large. *Antennæ* long and slender, longer than the head and prothorax together. *Mouth-cone* reaching the base of the prosternum, apex blunt and rounded. *Prothorax* transverse, not tuberculate, simple. *Legs* long and slender, all coxæ projecting and thus dorsally visible. *Fore-femora* of male not enlarged to any appreciable extent; each tarsus armed with a comparatively small tooth. *Wings* present. *Abdomen* long and slender. *Tube* exceptionally long, four times the length of the ninth abdominal segment, and twice the length of the head.

Species of medium size.

Type—*Panurothrips gracilis* mihi.

Panurothrips may be easily separated from allied genera by the form of prothorax as well as by the exceptionally long and slender tube.

Panurothrips gracilis sp. n. (Pl. VII., figs. 7, 8).

♀. Length 5·2 to 6·0 mm.; breadth of mesothorax about 0·55 mm.; length of tube 1·0 mm.

Colour dark chestnut brown, almost black; antennæ and all tibiæ and tarsi light yellow. *Head* finely and transversely striate, about three times as long as broad. *Cheeks* parallel, except for a slight broadening just before the neck; post-ocular spines small, two pairs of very small spines situated near same, and one similar spine on each side of head near base. Vertex raised and produced into a conical hump, at the extremity of which is seated the anterior ocellus. *Eyes* comparatively large, finely faceted and bulging slightly, space between them being one-third of the total width. *Ocelli* rather large, practically equidistant, the posterior pair being

* Panuro- =all tail.

situated above a line drawn through centre of eyes, and close to the inner margin of each. Owing to the raised vertex the three ocelli are on a higher level than the eyes. *Mouth-cone* short and rounded at apex. *Antennæ* approximate at base, inserted under the vertex, longer than the head and prothorax together, and very slender. Basal joint concealed at base; joints three to six elongate and claviform; apical joints fusiform. Third joint more than three times the length of basal joints together; fourth nearly two-thirds of third; fifth four-fifths of fourth; sixth shorter than the preceding, and equal in length to the penultimate and apical together. Basal joint concolorous with the head; second brown, and the others yellow, each joint being slightly darker at apex; joints seven and eight being brownish yellow. Antennal spines and sense-cones light and inconspicuous, apparently two long and acute sense-cones on each of the joints three to six. Owing to the light color of the antennal sense-cones and spines these organs are very difficult to see, and in one specimen there appears to be but a single sense-cone on joint three, which is on the outer side, and also on joint six, which is on the inner side; and there appear to be three or even four on the fourth joint. It is practically impossible, however, to make any definite statement with regard to these organs when the insect is dry and gummed on a card.

Prothorax small, a little more than one-third the length of head; transverse, widest at middle, and from thence strongly narrowed on both sides to the anterior and posterior margins respectively; spines inconspicuous. A fairly prominent spine on each fore-coxa. *Pterothorax* broader than prothorax, more than twice the width of the head; mesosternum broader than metasternum, but not so long; sides of the latter unevenly rounded and slightly narrowed to base of abdomen, possessing several minute white bristles. *Wings* short, apparently reaching nearly to the apex of the fifth abdominal segment. All *legs* long and slender, the posterior pair being the longest; the fore-femora very slightly enlarged, unarmed, and each fore-tarsus armed with a small sharp-pointed tooth. Surface of

limbs almost naked, the bristles and hairs being of the minutest description.

Abdomen simple, extremely long and slender, being three-quarters the length of the whole insect, and about one-twelfth as wide at base as it is long; tapered gradually to tube from the seventh segment. *Tube* very slender, four times the length of the ninth abdominal segment, or equal in length to segments seven to nine together, and twice as long as the head. Terminal hairs short and weak; spines on abdomen white, short and stout, those at the apical angles of each segment being the longest.

♂. A specimen which appears to be the male is smaller and more slender, whilst the antennæ are comparatively shorter and stouter. The fore-femora are not thickened, though the tarsal spur appears to be very slightly stronger. It is unfortunately difficult to discriminate the sexes in dried and carded specimens.

Type—In British Museum.

Hab.—Bangkok, Siam, three specimens.

Genus IDOLOTHRIPS Haliday

Idolothrips quadrituberculata sp. n. (Pl. VII., fig. 9).

♀. Length about 4 mm.; breadth of mesothorax 0·6 mm.

Colour very dark brown, almost black; femora brown; tibiæ and knees yellow shaded with a band of brown below each knee: tarsi yellow shaded with brown; antennæ (excepting basal joints) yellow; joints tinged with brown at apices. Antennal joints 6–8 broken off in the type specimen.

Head cylindrical, twice as long as wide; surface finely striated transversely. *Cheeks* set with but a few short slender spines; head broadened a little just before the constriction at base; vertex produced into a prominent conical hump in front of the eyes, which does not over-reach the insertion of antennæ. *Eyes* larger, rather finely faceted, bulging slightly. *Ocelli* large, comparatively widely separated; the posterior pair just

above a line with the middle of the eyes and on their margins; anterior ocellus occupying the extreme vertex. *Antennæ* approximate at base, inserted under vertex; broken in type specimen, but evidently twice or more than twice the length of head, and very slender; basal joint cylindrical and stout; second shorter; third long and slender, six times the length of the second; fourth five-sixths of the third, and fifth about four-fifths of the fourth. Sense-cones and spines light and inconspicuous.

Prothorax about two-fifths the length of head; a spine-set tubercle at each posterior angle, and a similar tubercle with the spine directed forward at each anterior angle; a depression or fovea on the inner side of each anterior tubercle, and disc raised slightly from these depressions to base; surface reticulate. Fore-coxæ with one fairly conspicuous spine. *Pterothorax* more than twice as wide as the head, almost square, and with the sides almost parallel. *Wings* long, reaching to the ninth abdominal segment. *Legs* long; fore-femora very slightly swollen; legs set with a few long slender black spines and a number of shorter and slenderer ones.

Abdomen broad, elongate-ovate, widening from the first to the fourth segment, and gradually narrowing from thence to tube, which is broken off in the type specimen; terminal hairs not long, weak; spines comparatively long and slender.

Type—One female in British Museum.

Hab.—Japan.

Idolothrips longiceps sp. n. (Pl. VII., fig. 10).

♂. Length 4·75 mm.; breadth of mesothorax 0·55 mm.

General *colour* coal-black; fore-femora and tarsi dark brown; antennal joints three and four yellow shaded with brown at apices; joints five and six yellowish-brown at bases, and second joint yellowish-brown at apex.

Head very long, cylindrical; three times as long as broad, and not quite three times the length of the prothorax. Surface of head finely striate transversely; cheeks set with a few short,

stout spines, a lateral spine immediately behind eye larger and particularly noticeable; head very slightly and gradually broadened towards basal third; vertex produced into a conical lump in front of the eyes which nearly reaches the insertion of antennæ. *Eyes* comparatively large, finely faceted, distinctly bulging; post-ocular spines moderately long. *Ocelli* medium sized, placed as in *I. quadrituberculata*, a long spine protecting the anterior one on each side. *Antennæ* approximate at base, inserted under vertex; stouter than usual and only about one and one-third times the length of head; first and second joints practically subequal in length, the first cylindrical, and the second not so wide and narrowed to base; third to fifth mildly claviform; sixth to eighth fusiform. Third joint three times the length of second; fourth a little more than two-thirds of third; fifth three-quarters of fourth; sixth nearly two-thirds of fifth, and two-thirds the length of the penultimate and apical joints together. Sense-cones long, light, and inconspicuous; spines also comparatively long.

Prothorax only about one and one-quarter as broad as long, widened very gradually from anterior margin to mid-line, and from thence to base irregularly narrowed; spines at each angle rather long and stout, and set on slight prominences; spine on the outer angle of each fore-coxa conspicuously long. *Pterothorax* longer than broad, more than twice the width of head; a rather long lateral bristle below each anterior angle. *Wings* reaching to the sixth abdominal segment, heavily fringed. Legs long; femora slightly thickened and set with a few more or less long and conspicuous spines, and a series of stouter spines (both long and short) on the outer edge of fore-femora, especially near the base; each fore-tibia produced to a spine-set tooth at the apex within, and each tarsus armed with a moderately long and stout tooth.

Abdomen long, slender, and tapering from base to tube; about two-thirds the length of the whole insect. *Tube* about three times as long as the ninth abdominal segment, and two-thirds the length of head; narrowing from the apical third to apex; hairs encircling apex very short, and those on ninth

abdominal segment only reaching to the middle of tube; abdominal spines also short and weak.

Type—One male in coll. Godman and Salvin.

Hab.—Orizaba (H.S. and F.D.G., Dec., 1857).

Idolothrips assimilis sp. n. (Pl. VII., fig. 11).

Length 4 mm.; breadth of mesothorax 0·6 mm.

Very closely resembling *I. longiceps*, but decidedly broader and differing in the following respects.

Head only about two and one-half times as long as wide, without spines protecting anterior ocellus, nor the conspicuous lateral spine behind each eye; spines generally not so strong, with the exception of the post-ocular one, which is extremely long.

Prothorax with short mid-lateral spines, those at fore-angles weaker and not set on small warts; those at posterior angles much longer; posterior-marginal spines also comparatively long. Spines on legs not so stout, but all sparingly armed with some very long bristles; fore-tibia not produced to a tooth at apex within; the tarsal tooth only small. *Wings* longer, reaching to the ninth abdominal segment.

Abdomen (curled in the type specimen) apparently much broader, elongate-ovate, broadening from base to fourth segment, and then gradually narrowing to tube. *Tube* broader and gradually narrowing to the apex from base. Terminal hairs slightly longer; abdominal bristles decidedly longer and more slender.

Type—One male in coll. Godman and Salvin.

Hab.—Chontales, Nicaragua (*Jansen*).

Idolothrips affinis sp. n.

Length 4·8 mm.; breadth of mesothorax 0·73 mm.

Closely allied to *I. assimilis*, larger, and differing chiefly in the absence or abbreviation of the post-ocular and prothoracic spines, and in the legs which are set with fewer spines.

Colour coal-black; fore-tibiæ and tarsi dark brown; third joint of antennæ yellow, tipped with brown; basal halves of joints four and five yellow.

Head as in *I. assimilis*; post-ocular spines short; antennæ not quite one and one-half times the length of head; joints three to five mildly claviform; six to eight fusiform. Third joint three and a half times the length of second; fourth two-thirds of third; fifth but slightly shorter than fourth; sixth very slightly shorter than fifth, and a little shorter than the two apical joints together. Spines at posterior angles of prothorax not long; those on all femora short and slender, with the exception of a few very long bristles on outer edges. *Wings* coriaceous, strong, only reaching to seventh abdominal segment. *Pterothorax* two and one-half times the width of head, and almost square.

Abdomen only slightly broader than pterothorax, tapering very gradually to tube from the third segment. *Tube* gradually narrowing from base to apex. Abdominal hairs and spines decidedly weaker than in *I. assimilis*.

Type—One female in British Museum.

Hab.—Chontales, Nicaragua.

Idolothrips foveicollis sp. n. (Pl. VII., fig. 12).

♀. Length 7–8 mm.; breadth of mesothorax 0·9 mm.

Colour black; tibiæ and tarsi brownish; stems of antennal joints three to five yellowish-brown.

Head cylindrical, two and one-half times as long as wide, narrowed behind eyes, and widened slightly before constriction at base; vertex produced shortly beyond eyes. *Cheeks* set with a few long spines and several shorter ones. *Eyes* rather large and finely faceted, bulging very slightly. Post-ocular spines exceptionally long, and placed much further behind eyes than is usual. *Ocelli* large, posterior pair near to inner margins of eyes and above the mid-line; anterior ocellus near vertex, and protected by a pair of strong spines. *Antennæ* inserted at extreme apex of head and separated at base; long and slender, one and three-quarter times the length of head. Joints three to

five claviform; six to eight fusiform. Basal joints short; third joint nearly six times the length of second; fourth and fifth subequal, together as long as the third; sixth and seventh subequal, and together very slightly longer than the fifth; apical joint one-half the length of the penultimate; spines and sense-cones inconspicuous.

Prothorax one-half the length of head, and about one-quarter broader than long, irregularly foveolate, a very deep transverse depression before base, and with irregular and somewhat shallow fovea on each side of central channel, which is most distinct apically. Strong spine-set tubercle at each posterior angle. The fore-coxa is armed with one very long spine and a few subsidiary spines. The fore-femora are slightly swollen, and have each a few long spines on the outer edge and several shorter ones, as well as a regular series near the inner edge. The fore-tarsal tooth is very minute. *Pterothorax* nearly half as broad again as the prothorax, and two and a half times the width of head. Metasternum laterally rounded and narrowed to base. Intermediate and posterior legs long and slender. *Wings* reaching to sixth abdominal segment; cilia not heavy. *Tube* long and slender, slightly longer than the head, and at least three times the length of the ninth abdominal segment; terminal hairs short and weak. Bristles at apex of ninth abdominal segment about three-quarters the length of tube. Abdominal spines comparatively long.

♂. The male is slightly smaller than the female, and has the fore-femora slightly more swollen; the fore-tibiæ broader, and the fore-tarsus armed with a strong broad tooth. The *abdomen* is slenderer, whilst the *tube* is very slender. The ninth abdominal segment is shorter, and the tube, though only the length of the head, is six times the length of the ninth abdominal segment.

Type—In coll. Godman and Salvin.

Hab.—Several specimens, Cerro Zunil, Central America, 4–5000 feet *(Champion)*.

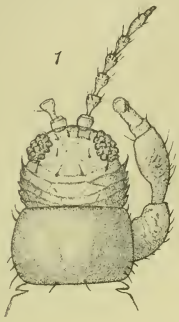
EXPLANATION OF PLATES

Plate VI.

1. Apterothrips subreticulata, gen. et sp. nov. ♀. Head, antenna, prothorax and fore-leg × 75.
2. ,, ,, End of abdomen × 75.
3. ,, ,, Maxillary palpus × about 350.
4. Macrothrips papuensis (Bagnall) ♂. Maxillary palpus × 50.
5. Machatothrips biuncinata, gen. et sp. nov. ♂. Left fore-leg × 30.
6. ,, ,, Maxillary palpus × 50.
7. Dinothrips sumatrensis, gen. et sp. nov. ♂. Right mesosternal projection × 12.
8. Diceratothrips bicornis, gen. et sp. nov. Head, antenna and fore-leg × 25.
9. ,, ,, End of abdomen × 17.
10. Phlœothrips spinipes, sp. nov. Head × 25.
11. Leurothrips albomaculata, gen. et sp nov. × 12.
12. ,, ,, Antenna × 30.
13. Eurynothrips magnicollis, gen. et sp. nov. Head, antenna and prothorax × 25.
14. ,, ,, Maxillary palpus × 60.
15. ,, denticollis, sp. nov. Head, prothorax and fore-leg × 25.
16. Docessissophothrips ampliceps, gen. et sp. nov. Head and prothorax viewed dorsally × 25.
17. ,, ,, Head and prothorax viewed laterally × 25.

Plate VII.

1. Eupathithrips dentipes, gen. et sp. nov. Head, prothorax and fore-legs × 12.
2. ,, ,, Fore-tibia and tarsus × 25.
3. ,, ,, Antennal joints 5 and part of 6, showing sense organs × 50.
4. ,, ,, Maxillary palpus × 50.
5. Acanthinothrips spectrum (Haliday) ♂. End of abdomen × 12.
6. ,, ,, Antenna × 12.
7. Panurothrips gracilis, gen. et sp. nov. × 12.
8. ,, ,, Head and antenna × 25.
9. Idolothrips quadrituberculata, sp. nov. Head and prothorax × 25.
10. ,, longiceps, sp. nov. Head, antenna, prothorax and fore-leg × 25.
11. ,, assimilis, sp. nov. Head × 25.
12. ,, foveicollis, sp. nov. Head, antenna, prothorax and fore-leg × 25.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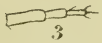
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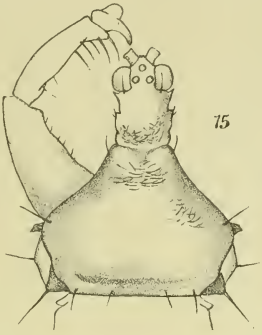
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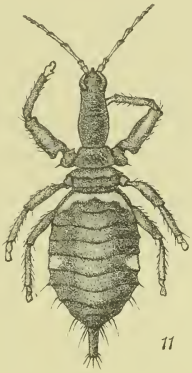
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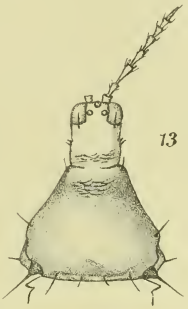
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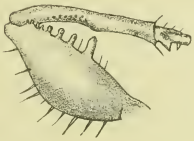
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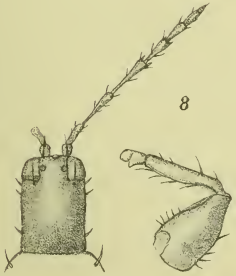
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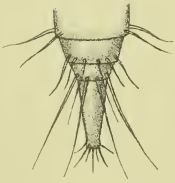
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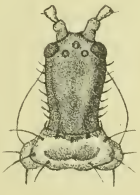
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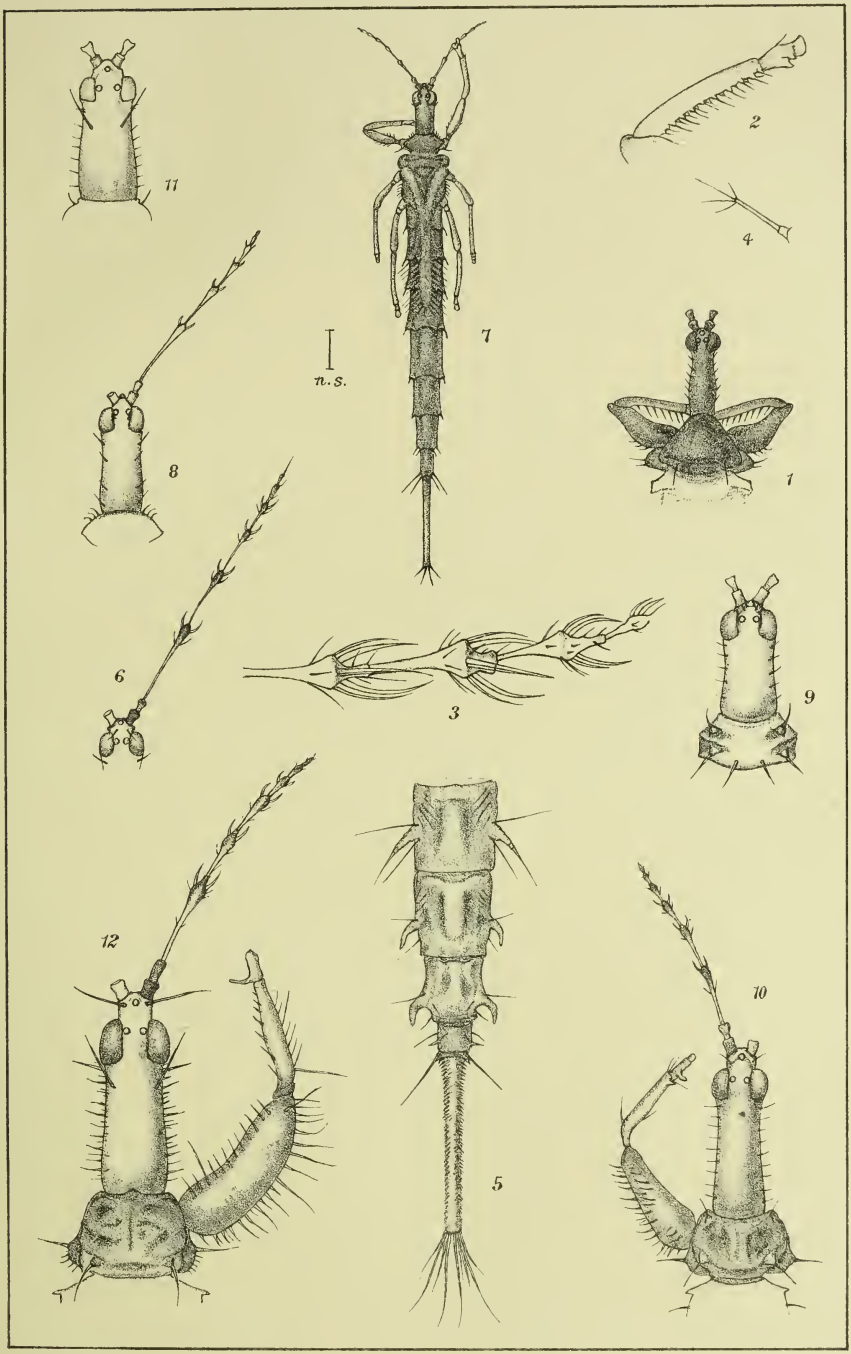
R. S. Bagnall, del. W. West lith.

NEW THYSANOPTERA.



R. S. Bagnall, del

W. West lith.

NEW THYSANOPTERA

ADDENDUM

Papers on Thysanoptera are very much scattered, and since going to press I have had opportunities of studying further references, and regret to find that I have unfortunately described herein a species *(Leurothrips albomaculata)* as new, which has really been known since 1883. *Leurothrips albomaculata* must drop as a synonym of *Leurothrips (Phlœothrips) albosignata* Reuter, which is very fully described by Prof. Reuter in the *Revue d'Entomolog.*, 1885, and is evidently the *Phlœothrips bigemmata* mentioned, without description, by Costa in his *Notizie ed osservazioni sulla geo-fauna sarda (Tisanotteri)**.

The synonymy should read thus :—

GENUS LEUROTHRIPS Bagnall

Leurothrips albosignata Reuter

1883	*Phlœothrips bigemmata*	Costa., Geo-fauna sarda (2), p. 71.
1884	„ *albosignata*	Reuter, Revue d'Entomol., III., p. 290.
1885	„ „	Costa, Geo-fauna sarda (4), p. 12.
1895	„ „	Uzel, Mon. der Ordn. Thysanoptera, p. 270.
1908	*Leurothrips albomaculata*	Bagnall, Trans. Nat. Hist. Soc. North'd., D'ham, and Newcastle, n.s. III., pl. VI., figs. 11, 12, p. 197.
1908	„ *albosignata*	idem ibidem, addendum, p. 217.

Hab.—Sardinia *(Costa)*. Algeria : Tlemcen *(Marmotton)*.

Two unlabelled specimens in the British Museum *(Pascoe)*, and five specimens in the Dublin Museum labelled "Algeria *(Rippon)*."

* Atti Acad. Napoli (2), vol. i., p. 71.

MISCELLANEA

Bird Notes for 1907–8

Brown Variety of Partridge.—The remarkable dark brown variety of the Partridge has re-appeared in the central part of Northumberland, on the estate of Mr. T. H. Bainbridge at Eshott. This was in the autumn of 1907, and one of the brown birds which was shot has been preserved by Duncan. The brown variety was at one time known as *Perdix montana*; it has occurred in various parts of England and the Continent, and has long been known in mid-Northumberland. Its appearances have, however, been very irregular, and for some years past it has not been heard of in this county. It is pleasing therefore to know that the strain, or the tendency to this striking variation, has not died out in the district.

Woodpecker in Jesmond.—During the third week of November, 1907, a Greater Spotted Woodpecker was seen for some days about the gardens near Jesmond Station and in other parts of Jesmond. It was reported first by Mr. Jos. G. Angus, and other reports of its presence were brought to us for some days afterwards.

Grey Shrikes in 1907.—The landing of a small number of Great Grey Shrikes on the north-east coast is a regular event in the autumn, but the immigration seems to have been unusually large in the autumn of 1907. We heard of many more than usual being shot or seen at Newbiggin and other places on the coast; and to judge by reports from different parts of the county, the number that penetrated inland and spent at least part of the winter there must have been considerable. Mr. Abel Chapman wrote of a shrike as having made a prolonged stay near his house on the North Tyne. A young male, still showing finely pencilled barrings on the breast, was shot by Mr. Geo. E. Crawhall's keeper near Haydon Bridge and was preserved at the museum.

Plumage-changes of Ducks.—The section of the ducks in the Hancock collection at the museum is largely made up of birds provided by Mr. Crawhall, and two of the further contributions made by him to this section during the winter of 1907-8 are rather particularly worthy of notice as showing interesting stages of plumage. A young male Wigeon (case 82, specimen 2) shot in January, and therefore eight or nine months old, has attained nearly perfect adult dress, except that the white feathers on the wing-joint are only just appearing; and a young Pintail drake (case 86, specimen 3) that was shot at the end of November also shows an interesting stage in the assumption of mature plumage. It is still mainly in the plumage of the young, but the pencilled feathers of the adult are beginning to appear on the back, and a broken line of white represents the broad white band on each side of the neck in the mature drake.

Swallows and Swifts.—On the coast between Whitley Bay and St. Mary's Island, on May 1st, 1908, we witnessed what was evidently a migration flight in progress. All the morning small parties of Swallows were passing northward up the coast, flying chiefly just above the sea banks. In contrast to their usual manner of flight, the steady and undeviating way in which these birds pushed forward towards the north was very striking. We saw at the same time a single party of five Swifts, similarly flying directly northward, but at probably three times the speed of the Swallows. This is a very early date for Swifts to be seen in Northumberland, and it is interesting therefore that one was noticed on the same day inland, at Haydon Bridge, by Mr. Crawhall's keeper. There were many other evidences of migration that morning at St. Mary's Island. Numbers of Wheatears and Pied Wagtails were about on the rocks, and we also saw a pair of Yellow Wagtails *(M. raii)*, rather scarce birds in this district at any time.

In a note in the last volume of these Transactions (New Ser., vol. ii., p. 304) I remarked that here, as in other parts of

the country, a few Swifts are still to be seen regularly in the early days of September. This has again been the case in the autumns of 1907 and 1908. In 1907, indeed, quite a large number of Swifts, between a dozen and twenty, congregated over the Leazes Park, Newcastle, every evening up to September 2nd; and I believe some of them stayed considerably later. In any case in 1908 I saw three Swifts fly over the Leazes Park on the morning of September 15th.

Dotterels on Migration.—It is well known to local ornithologists that parties of Dotterels *(Eudromias morinellus)* used regularly to appear on the Newcastle Town Moor on their northward migration in May, sometimes also on the return migration in autumn. In recent years, however, they have rarely been noticed, and it is therefore worth while to record that Dotterels were again seen on the Town Moor in May of 1908. A party of four, two males and two females, settled on the far part of the Moor on the afternoon of May 15th. I was told that evening by Mr. Geo. A. Atkinson that they were there, and I saw them myself just before dusk. I found them in the same place next morning, and they stayed in fact more than three days; at least I came upon one pair there late in the evening of the 18th. During their whole stay the Dotterels were extraordinarily tame; it was quite easy at any time to walk up to within ten yards of them.*

Sandgrouse in 1908.—Through Mr. J. D. Walker also we hear that a Sandgrouse *(Syrrhaptes paradoxus)* was shot on

* Since this paragraph was in type some further interesting information about the Dotterels has come to hand. Mr. J. D. Walker is able to state that they still regularly visit the Newcastle Town Moor in early autumn; he has seen them there himself almost every year. He also reports that a flock of twenty Dotterels appeared at Newbiggin in the earlier part of May this year (1908); sixteen of them are known to have been shot for the trout-fly makers, and Mr. Walker suggests that the four that visited the Town Moor may have been the survivors of this unfortunate band. Mr. F. Longstaff tells me that on the autumn migration Dotterels annually visit Newbiggin, where toll is always taken of them; and he once saw several large flocks of them on the golf course at Cleadon.

July 31st, 1908, at Newbiggin. An 'irruption' of Sandgrouse in Central Europe has attracted a good deal of attention this year, and the occurrence of this bird at Newbiggin is doubtless connected with the same movement. This year's irruption, however, has not been by any means on the scale of those of 1863 and 1888; comparatively few of the birds have penetrated as far to the north-west as England.

Glossy Ibises at Alnmouth.—On September 3rd, 1908, a Glossy Ibis *(Plegadis falcinellus)* was sent to the museum by "Whist" of the "Newcastle Journal," with the information that it had been shot at Alnmouth two days previously by Mr. Thomas Jefferson. Through "Whist's" good offices it was presented by Mr. Jefferson to the museum; and it was followed on the evening of September 5th by a second example from the same source. Mr. Jefferson subsequently furnished us with an interesting account of the birds. It appears that to begin with there was a party of five ibises. They were first seen about noon on Sunday, August 30th, at Boulmer, having apparently come in from the sea, flying in single file, and heading towards Alnmouth. They seem to have been exhausted, for that afternoon near Alnmouth some small boys were chasing them about and throwing stones at them. Later they were very difficult to approach. In addition to the two shot by Mr. Jefferson, one was picked up dead, and a fourth was taken alive in a trap the following week. This last bird was kept alive for a few days by Mr. D. Deuchar of Warkworth, for whom it has since been preserved.

Mr. Jefferson notes that the ibises frequented the burns near the coast rather than the coast itself, and that they always flew inland when disturbed. Of the two examples presented by him to the museum, one, the first, is very distinctly larger than the other. There is a difference of practically an inch in length of bill ($5\frac{1}{16}$ ins. to $4\frac{3}{16}$ ins.), and other measurements differ in the same proportion. Both birds are in immature plumage, the back dark irridescent green, and the head and neck dusky brown streaked and speckled with

white ; but the difference in size and a well marked difference in the nature of the plumage suggest strongly that the smaller bird is in its first year and the larger in its second.

The occurrence of this party of ibises is one of the most noteworthy events of recent years in local ornithology. The Glossy Ibis, though fairly abundant in the southern and eastern parts of the Continent, rarely finds its way to England, and then as a rule only to the southern counties. There is only one previous record of the species for Northumberland or Durham, and that dates back to the time of Selby. The stormy weather that prevailed about the time might be supposed to have some connexion with the appearance of this party, but as a matter of fact the worst gales were on the two days following the arrival of the birds. Perhaps it is more likely that their deviation from their normal migration track is due to the same cause, whatever that may be, as has produced the recent movement in the same direction on the part of that other south-eastern bird the Sandgrouse.

E. Leonard Gill.

Limax tenellus Müll. *at Corbridge*.—In November, 1907, on the Fell near Dipton Woods, Corbridge, I found two specimens of this rare or rather little known slug. Mr. Denison Roebuck kindly confirmed my identification. The slugs were feeding on a large white fungus by the road-side close to some fir trees. This is the first time *Limax tenellus* has been found in Northumberland, and it is specially interesting because this is the nearest record to Shotley Bridge, where the first British specimens were found by Mr. Blacklock and recorded by Alder (Catalogue of the Mollusca of Northumberland and Durham [1848], p. 31). It is probably really not rare, although seldom seen because its habitat is very different from that of most slugs, being always in the neighbourhood of fir trees, sometimes on them. Also it is specially to be found in the autumn months. It is to be hoped that other Northumberland records will be forthcoming.—*Marie V. Lebour.*

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NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE

REPORT OF THE COUNCIL

FOR 1907–1908

In their report for last year your Council had regretfully to record a decrease in the membership of the Society. This decrease had been slowly in progress for three years, and during that time the membership had fallen by 30. It is therefore with pleasure that the Council are this year able to state that there has been a check in this disquieting decline; the loss by death and resignation has been 19, and 30 new members have been elected, the consequent gain of 11 bringing up the total membership at the end of the year to 420. Several members of the Council and others have exerted themselves with some success to bring in fresh subscribers; and in so doing they have made use of a card which has been printed, giving a few leading facts concerning the Society and its work. Copies of this card will gladly be sent by the honorary secretaries to any members who are prepared to make use of them.

The pressing need for a larger membership and further support will be sufficiently evident from the balance sheet. For the first time for a very long period there is a considerable deficit. The greater activity of the last few years, in the direction of publishing papers, organizing lectures, and dealing with the museum work, has naturally involved an increased annual expenditure. The increase has been comparatively slight, but in spite of all the efforts that have been made the roll of subscribers has not been sufficiently enlarged to meet it. The result has been a gradually dwindling balance, which this

year has passed over into a deficit. It is not yet clear how the difficulty will be met; but there can be no doubt that the most satisfactory solution would be a greatly augmented annual subscription list, and the Council would most earnestly urge upon members the need for their co-operation to attain this end.

It has frequently been said that too little is known about the museum in the town and district. In the hope of remedying this to some extent, a series of articles on the history and present circumstances of the museum and the Society were prepared by the Curator, and were published during the winter, with a number of illustrations, in the "Newcastle Daily Chronicle." The Society is much indebted to the proprietors of this paper for the publicity given to the articles. Believing that many members will like to have such a record of the history of the institution in permanent form, the Council have ordered it to be printed as an appendix to the current issue of the Transactions. A limited number of reprints in pamphlet form can also be supplied for special purposes.

Of the Society's Transactions, a part has not been actually issued during the year. Volume III., New Series, part 1, has been almost ready to send out for some time, but has been kept back in order to include some important additional matter. Among the papers appearing in it are a further contribution on the Trematodes of the Northumberland coast, by Miss M. V. Lebour; a report on rare Arachnids captured in 1907, by Dr. A. Randell Jackson; a description and explanation, by Dr. J. A. Smythe, of the glacial phenomena of the country between the Tyne and the Wansbeck; the concluding part of Col. C. H. E. Adamson's catalogue of his collection of Burmese butterflies; a paper on some special Allendale spiders, by the Rev. J. E. Hull; and descriptions of some remarkable new Thysanoptera or thrips, by Mr. R. S. Bagnall.

A special Publication Fund was raised last year to meet the unusually heavy charges that were being incurred at that time in the publication of the Transactions. The Treasurer's

report shows that there is still nominally a balance remaining from the sum raised, but it should be understood that the balance has in reality already been spent upon the printing of the papers mentioned above. It must also be borne in mind that there is in hand the manuscript of the catalogue of local crustacea by Canon Norman and Dr. Brady, probably the most important and authoritative of all the Society's fine series of local natural history catalogues. This should be proceeded with at once; and it is further very desirable that the concluding part of the late Mr. J. E. Robson's lepidoptera catalogue, which is being edited by Mr. Eustace Bankes, should be issued without delay. The Council therefore hope that the Publication Fund may be kept alive, and are contemplating a further appeal for its support. The issue of scientific papers is a valuable and recognized part of the Society's work, and one that should on no account be abandoned; and on the other hand, in the present financial difficulties, it is most necessary that the cost of it should be kept from falling upon the general funds.

Various questions connected with the library have been considered during the year by a specially appointed Library Committee. This committee has revised the list of societies and institutions with which publications are exchanged, and has examined into the system upon which the library is kept. It reported that a large amount of bookbinding was really needed, and referred to a few works that particularly required it. Even these, however, in the present state of the Society's finances, would have had to remain unbound, had not certain members of the Council generously come forward and had them bound at their own expense. The Council wish to call the attention of members to the fact that the library is now properly arranged and catalogued, and that its use by the members will be welcomed. It contains many valuable works to be met with in very few libraries; especially is this the case among the books left to the Society by the late W. C. Hewitson.

At the Royal Agricultural Society's Show, held this summer in Newcastle, a bay in the educational section was allotted to the Natural History Society, and was fitted up by the museum staff to illustrate some special features of local natural history—birds of the Farne Islands, wildfowl of Holy Island, characteristic shore fauna, etc. The experiment was decidedly successful; the museum bay, and especially a reproduction of a rock pool which formed the centre-piece of it, drew a great deal of attention and favourable comment. Another outcome of the Royal Show has been a temporary exhibition at the museum illustrating principles of forestry. The forestry section of the Royal Show this year was so particularly instructive, and most visitors to the show had so little opportunity of studying it, that it was felt to be well worth while to keep some part of it together for a few weeks longer and put it on exhibition at the museum. This it was fortunately possible to arrange for, and the objects have been exhibited there for about two months. Most of them were lent either by the Duke of Northumberland, through his head forester, Mr. A. T. Gillanders, or by the agricultural and botanical departments of Armstrong College, through Mr. J. F. Annand and Prof. M. C. Potter. The usefulness of the exhibition has been materially added to by lectures which have been given upon it to the public and to various groups of visitors by Mr. Annand and Mr. Gillanders. It has also, by special arrangement, been visited by classes from all the Council schools of the town, after Mr. Annand had given a preliminary demonstration upon it to the teachers.

The only repairs to the building during the year have been of a trivial character. After the heavy expense incurred last year in replacing one of the boilers it is imperatively necessary to economise in this direction, though some additions to the hot water system are much needed. The outside railings have been painted, but the charge for this does not come into the balance sheet of the year under review.

The Hancock Prize for 1907 was awarded to Miss Florence Hodgson, of South Shields, for an essay on "An Autumn

Walk in Tynedale." Eighteen essays were sent in, and the examiners, Prof. G. S. Brady and Prof. A. Meek, spoke in high terms of the majority of them. The Council have been gratified by the greatly increased interest shown in the competition and by the marked rise in the number of competitors. It is obvious now every year that the competition is having a real effect in encouraging outdoor natural history pursuits in the district.

The attendance of visitors to the museum, as registered by the turnstile, was 18,840 for the year. The day on which the greatest number entered was Easter Monday, when 1,350 people passed the turnstile. A course of lectures and "talks," similar to those given every winter for the last few years, was arranged and successfully carried out. The syllabus is printed as an appendix to the report, and it is only necessary here to express the indebtedness of the Society to the lecturers, and to say that the attendances on the whole were very satisfactory. The average audience at the regular evening meetings was about 125, at the children's lectures 165, and at the "museum talks" 60. The recent improvement in the numbers attending the summer field meetings has also been well maintained. The separate report which is issued later renders it unnecessary to say more here than that a successful series of field meetings has been held. It has been suggested that it would be helpful to the younger naturalists if the field meetings could be supplemented by meetings for work in the winter evenings.

A large number of interesting donations have been received during the year, and will be found acknowledged at the end of the report. Some call for special mention. Col. C. H. E. Adamson has handed over the last cabinet of his collection of Burmese butterflies, and also a cabinet of lepidoptera and other insects from India. The Rev. J. E. Hull has largely added to a collection of local spiders given by him some years ago, and the series is now arranged and mounted so as to form a most useful reference collection. Some very good minerals, shells, and birds have been presented by Lord

Ridley; a carefully prepared set of Tasmanian lepidoptera by Mr. F. M. Littler, of Launceston, Tasmania; and a collection of butterflies from Nyasaland by Captain J. H. Cuthbert. Some good mammalian skulls were received as a bequest from the late Percy E. Page of Low Fell. The Curator has been allowed to make a selection from the duplicates in some of the departments at the Natural History Museum, South Kensington, and in this way were obtained a number of insects, echinoderms, and specimens of other classes particularly wanted in our collections. At the same time Prof. F. Jeffrey Bell added some further specimens as a personal gift from himself. Valuable additions to the mineral collection have been made by Mr. P. Walther, Mr. M. Pelegrin, and Mr. J. J. Oxley. Two very satisfactory exchanges have been arranged during the year with other museums. From the United States National Museum at Washington were received, in exchange for some local fossils, several beautiful stalked crinoids from the West Indian seas, which filled a long-standing gap in our collection; and with the museum at Bergen a similar set of our local fossils was exchanged for a most useful series of crustacea, worms, and other marine invertebrates. Two specially valuable gifts to the library must also be mentioned: the six volumes of Moore's "Lepidoptera Indica," presented by Col. Adamson, and a complete set of the monographs comprising "The Fauna of British India," a donation from the India Office.

NEW MEMBERS ELECTED

FROM JULY, 1907, TO JUNE, 1908

Cyril F. Bengough, Bracken Dene, Low Fell.
John W. Brown, Grosvenor House, Monkseaton.
Basil G. Bryant, King Street, Quayside.
Christopher C. Cadman, North of England Fish Hatchery, Barrasford.
H. G. Carr-Ellison, 15, Portland Terrace, Newcastle.
Major Edward Clayton, Walwick Hall, Humshaugh.
Newbey Green, 29, Brandling Park, Newcastle.
John Harbottle, Wyndale, Corbridge.
Percy Harrison, Earlswood, Low Fell.
John Havelock, Eastwood, Jesmond Park East.
Robert John Hoy, J.P., 17, Stratford Grove, Newcastle.
John Losh, 269, Westgate Road, Newcastle.
Mrs. Chas. Low, 5, Framlington Place, Newcastle.
Leonard Macarthy, St. Oswin's, Tynemouth.
C. T. Maling, 14, Ellison Place, Newcastle.
George Mathwin, 15, Tankerville Terrace, Newcastle.
Arthur Clement Margery, 4, Bentinck Terrace, Newcastle.
Sir Charles S. Milburn, Bart., Guyzance, Acklington.
Jas. Arnott Sisson, Jnr., Hillcroft, Low Fell.
Edward Sisterson, Woodley Field, Hexham.
E. J. Sutton, 41, Side, Newcastle.
Herbert G. Taylor, Byker Vicarage, Newcastle.
John Thorburn, Jesmond Road, Newcastle.
Wm. Torry, 16, Rectory Terrace, Gosforth.
F. B. T. Trevelyan, 1, Victoria Terrace, Newbiggin-by-the-Sea.
Johnstone Wallace, Parkholme, Beech Grove Road, Newcastle.
Percy F. Ward, 10, Summerhill Terrace, Newcastle.
Cuthbert B. Wilson, 42, Blackett Street, Newcastle.
Henry B. Wilson, Gallowgate, Newcastle.
W. A. Wilson, 46, Oxford Avenue, Westoe, South Shields.

CURATOR'S REPORT ON MUSEUM WORK

1907–1908

The addition of Mr. Fletcher to the museum staff has made itself felt in a decided and gratifying manner in the amount of work accomplished during the year. The course of my own proper museum work is necessarily subject to very frequent interruption and suspension, and it is a great gain that skilled work can now be going steadily forward under almost any circumstances.

One considerable break in the regular work has, however, occurred during the year, for the preparation of our set of exhibits for the Royal Show took up most of the time of our limited staff for some weeks. But the success of the museum stand seemed to prove that the time had been laid out to good purpose. As the centre-piece of the bay allotted to us, we fitted up a small reproduction in formalin of a local rock-pool, with a set of characteristic inhabitants; and illuminated from behind it formed a very attractive object. In preparing this rock-pool we experienced considerable difficulty and loss of time through mishaps caused by the expansion of Portland cement; indeed we should have been unable in the end to show the pool at all had not Mr. N. H. Martin very kindly had a special vessel made to encase it. A key-chart was placed below the pool; we provided non-technical explanatory labels also throughout the whole series of exhibits, and we were pleased to see that these labels were carefully read by many of the visitors.

It is in the zoology room that the chief progressive work of the year has been done. The overhauling of the desk-cases devoted to the invertebrates is the special work I have put into Mr. Fletcher's hands, and he has made good progress with it. The sets of specimens illustrating the Protozoa, Coelenterates, Echinoderms, Worms and Crustacea have been properly classified and neatly installed; a number of the explanatory labels have still to be put in, and a final arrangement of some of the upright centre-cases is not yet possible, but

even as it stands the work represents a striking improvement both in appearance and utility over what was shown in these cases before. If only we were able to spend a little money upon specimens and fittings a still greater advance would at once be possible. Above the shell-cases, which are not yet provided with fixed centre-cases, we have placed some narrow upright cases from the old museum, and in these are now shown a number of shells which are too large for the desk-cases below. This not only adds to the value of the shell collection, but also decidedly improves the general appearance of the room. Many specimens, including a few dissections that we have made, have been mounted in spirit or formalin in glass jars, and a section in which the museum was formerly very weak is thus being rapidly strengthened. A good many of the specimens used for this purpose were obtained during several mornings which we spent in collecting on the neighbouring coast; all the material for the reproduction of the rock-pool was procured in this way, and we are much indebted to Mr. George Sisson for the help he gave us in collecting it. We are trying some experiments to test the late Dr. Sorby's plan of mounting zoological specimens in glycerine to preserve their natural colours; some brightly coloured starfishes treated on this method have so far given a successful result.

The classification and re-installation of the Tankerville collection of corals has been completed. The method on which the collection is now displayed was briefly described in last year's report; for the Alcyonaria and sponges, which also form part of the collection, it was somewhat modified: the shelves used were of thick window-glass instead of rough plate-glass, and were placed horizontally instead of on a slope, the specimens being mounted so as to stand upright on wooden blocks. The effect of the whole range of cases is extremely pleasing. The identification of the corals and Alcyonaria had to be done almost entirely from books, and this made it a difficult and lengthy task. Various other pieces of work in the zoology room have been done or are in hand. The excellent collection of local spiders presented by the

Rev. J. E. Hull has been arranged in drawers for reference; the spiders are put up in glass tubes which are mounted on cards, the attachment being such that the tubes may be readily drawn out for close examination. A large number of tropical butterflies and other insects have been relaxed and set; the reptile cases have been cleaned and the contents are being overhauled; some rabbits and hares (which oddly enough were practically not represented in the museum) have been mounted. The cast of a large trout, which I prepared and coloured, has met with much approval among anglers; this is a class of work that takes up too much time to be really admissible here under present circumstances, but more of it is badly needed, and we must hope some day to be in a position to undertake it. Some birds have been mounted for the Hancock collection, chiefly ducks in various interesting states of plumage obtained for us by Mr. G. E. Crawhall.

Relaxing and setting butterflies has been the chief work done by Miss Welford in the time she has had left over from clerical duties. She has also arranged the pamphlets in the library, and has made wrappers for the packets of mounted plants in the large reference herbarium.

We have to thank Mr. H. Eltringham for the valuable work he is doing for us in identifying our foreign Lepidoptera. Col. Adamson has also spent much time at the museum in identifying a series of Burmese moths which he presented recently. In connexion with the mineral and rock collections I have been very kindly assisted by the Rev. Mark Fletcher and Dr. Woolacott; and I have further to thank Mr. Richard Adamson and the Rev. W. McLean Brown for again last winter each taking my place at one of the "museum talks."

I stated at the beginning of this report that we were feeling agreeably the effect of having an addition of one member to the museum staff. At the risk of seeming ungrateful, however, I am compelled to add that we are by no means yet in a position to bring such a large museum up to its point of fullest usefulness and maintain it there. At present, in fact, we are

not even getting the full benefit of the recent increase in staff; for in the work on the zoological collections this year we have constantly had to abandon plans and put up with makeshifts because money was not forthcoming for purposes which in most other museums are treated as matters of necessity.

E. Leonard Gill.

EVENING MEETINGS HELD DURING THE WINTER SESSION, 1907–1908

Nov. 13.—Mr. W. H. Young, F.L.S., F.Z.S.: "'Dragons of the Prime': Some Recent Discoveries in America and Egypt"; chair taken by Mr. R. Coltman Clephan, F.S.A.

Dec. 11.—Mr. John Davidson: "An Angler's Trip to the Faroe Islands"; chair taken by Mr. John Harbottle.

Jan. 8.—Rev. Arthur Watts, F.G.S.: "Glimpses of the Early History of the Earth"; chair taken by Mr. J. Alaric Richardson.

Feb. 12.—Rev. J. E. Hull, M.A.: "The Life History of a Spider"; chair taken by Mr. Jos. G. Angus.

Mar. 11.—Mr. B. Amsden, B.A., B.Sc., LL.B.: "Spring Flowers"; chair taken by Mr. Wilfred Hall.

Mar. 19.—Private Evening Meeting of the Society: Report on Field Meetings of the summer of 1907, by Mr. J. Alaric Richardson, Chairman of Field Meetings Committee; reading by Miss Florence Hodgson of her Hancock Prize Essay, "An Autumn Walk in Tynedale."

AFTERNOON LECTURES TO CHILDREN

Dec. 27.—Prof. Henry Louis, M.A.: "The Malay Peninsula and its Inhabitants"; chair taken by Sir Walter Plummer.

Jan. 3.—Dr. H. F. Standing: "Fact and Fable from Madagascar"; chair taken by Mr. E. J. J. Browell.

"MUSEUM TALKS"

1907–1908

Oct. 30.—Some Recent Acquisitions.

Nov. 27.—Fossils of the District.

Dec. 18.—Gamekeepers' Vermin.

Jan. 30.—Some Plants of the Bible (Rev. W. McLean Brown).

Feb. 26.—A Set of Skulls.

Mar. 25.—The Buttercup and its Kindred (Mr. Richard Adamson).

Apr. 29.—Wings and Flying Animals.

MUSEUM STAFF

CURATOR.....E. LEONARD GILL, M.Sc.

ASSISTANT .....HERBERT FLETCHER.

LADY ASSISTANT AND SECRETARY.....MISS E. WELFORD.

ATTENDANT.....WILLIAM VOUTT.

GARDENER .....ALBERT SPENCER.

NATURAL HISTORY SOCIETY OF NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE

HONORARY OFFICERS OF THE SOCIETY

Elected at the Annual Meeting, October 9th, 1907

PRESIDENT

The Right Hon. Lord Armstrong, M.A., D.C.L.

VICE-PRESIDENTS

The Duke of Northumberland.
Viscount Ridley.
Lord Barnard.
Lord Ravensworth.
Lord Joicey.
The Bishop of Durham.
The Bishop of Newcastle.
Sir Hugh Bell, Bart.
Sir Arthur Middleton, Bart.
Sir Andrew Noble, Bart., F.R.S.
Sir Isambard Owen, M.A., M.D.
Sir G. H. Philipson, M.D., D.C.L.
Sir John Swinburne, Bart.
Sir Lindsay Wood, Bart.
The Lord Mayor of Newcastle.
Lt.-Col. C. H. E. Adamson, C.I.E.
Col. W. M. Angus, C.B.
Prof. G. S. Brady, M.D., F.R.S.
E. J. J. Browell.
R. C. Clephan, F.S.A.
Norman C. Cookson.
Geo. E. Crawhall.
W. D. Cruddas.
R. R. Dees.
D. O. Drewett.
Samuel Graham.
H. N. Middleton.
John Pattinson, F.I.C.
Prof. M. C. Potter, M.A.

COUNCIL

Richard Adamson.
Hugh P. Angus.
G. A. Atkinson.
W. E. Beck.
Harry Benson.
John L. Gracie.
Wilfred Hall.
T. E. Hodgkin, M.A.
George Jenkins.
Prof. Alex. Meek, M.Sc.
C. E. Stuart, B.Sc.
J. D. Walker.

HON. SECRETARIES

N. H. Martin, F.R.S.E. | C. E. Robson.

HON. TREASURER

A. H. Dickinson.

HON. AUDITOR

Samuel Graham.

ADDITIONS TO THE MUSEUM

FOR THE YEAR ENDING JUNE 30TH, 1908

*** Except where otherwise stated, all the acquisitions mentioned are donations from the persons or institutions named.

LIEUT.-COL. C. H. E. ADAMSON, C.I.E.—The last cabinet of the donor's collection of Burmese butterflies, containing the Pierinæ. Another cabinet, containing Indian butterflies and other Indian insects. Eggs of greater and lesser pratincole from Burma. A fossil fern, *Sphenopteris crithmifolia*, from Jesmond Dene. Two polished pieces of jade from the mines on the Uru River, Upper Burma. A small portrait of the late W. C. Hewitson.

HUGH P. ANGUS.—Skull of boar dug up in Gallowgate, Newcastle.

GEO. A. ATKINSON.—Four shells of *Ceratisolen legumen* from the Solway.

JAMES BACKHOUSE.—Crystals of galena from the Stang and Cleasby Mines, Arkengarthdale, Yorks.

PROF. F. JEFFREY BELL, M.A.—A number of specimens for the museum, including the head of a stalked crinoid *(Pentacrinus mülleri)*, a colony of the coral Dendrophyllia, and the embryo and uterus of a dogfish.

HARRY BENSON.—Fifteen dried "pitchers" of various pitcher-plants *(Nepenthe)*.

BERGENS MUSEUM (Norway).—In exchange for local fossils: a number of authoritatively named marine invertebrates (small crustacea, 25 species; pantopoda, 2 species; tunicates, 4 species; worms, 14 species; holothurians, 2 species; an Asterophyton, some Gorgonacea, etc.)

WALTER BLACKETT.—The late Thomas Thompson's collection of eggs, with the drawers containing them.

ROBT. BLAIR, F.S.A.—Three pieces of Roman roofing tiles bearing foot-prints of dogs and lamb, from the Roman station at South Shields.

BRITISH MUSEUM (NATURAL HISTORY).—Specimens which the Curator was allowed to select from the duplicates in several departments at the Natural History Museum, South Kensington: 66 striking tropical beetles, and some crustaceans and echinoderms.

THOS. BULMAN.—A large number of lantern-slide views of the museum—interiors, groups of birds, etc.—together with most of the negatives.

Mrs. Burnham.—A small polished pair of horns of the African rhinoceros *(R. bicornis)*.

Lieut.-Col. R. H. Carr-Ellison.—Deposited on loan: a fine pair of red deer's antlers from the bed of the Tyne at Dunston; a Maori stone weapon, a Tahitian stone bread-pounder, and a South Sea Islands fish-hook; a large number of coins, Roman, English, and Continental.

James Caygill.—A number of boulders from the drift of the Consett district; various other geological specimens, including curiously weathered whinstone from the Great Whin Sill near Cauldron Snout, and ore and slag from two old iron workings.

J. Charlton.—A number of birds' eggs.

Norman C. Champness.—Some British and foreign shells. A shell of *Mya arenaria*, showing a curious duplication of the valves. Nests and eggs of wild duck and canary.

Abel Chapman.—Five bird skins from Spain, all in excellent condition: viz., flamingo (adult male and immature), white-faced duck, *Erismatura leucocephala* (pair of adults), and Bonelli's eagle, *Nisaëtus fasciatus* (immature female).

Isaac Clark, junr.—Natural history objects from Port Elizabeth, Cape Colony, including some characteristic insects, and the nest and eggs of a weaver bird, *Sitagra ocularia*.

Geo. E. Crawhall.—A number of ducks for the Hancock collection: two wigeon drakes, one fully adult, the other just coming into adult dress; pochard drake, adult; teal, adult female; young pintail drake assuming adult dress. A young male great grey shrike. Two hares and three rabbits. All the above from near Haydon Bridge. Also a lady's hat bought recently in Newcastle, "trimmed" with the skins of eight bullfinches; presented as a memorial of the "vandalism of the 20th century."

Capt. J. H. Cuthbert.—A collection of butterflies made by the donor in Nyasaland, about 200 specimens, together with a number of other insects (moths, stick-insects, mantises, etc.)

H. A. A. Dombrain.—A specimen of the owl *Strix lapponica* from Sweden.

J. Duguid.—A "double cocoa-nut" (fruit of the coco-de-mer tree) from Praslin Island, Seychelles.

R. Duncan (Robin Hood's Bay).—Fossil tooth of the shark *Lamna* from the Isle of Sheppey, Kent.

Dr. J. T. Dunlop.—A stuffed albatross, immature.

Jno. J. Eden (Hartlepool.)—Three examples of a tropical wasp-beetle, *Cylene crenicornis*, Chev., imported in timber from the West Indies.

Dr. J. F. Glencross.—Various geological and natural history objects, including good pieces of *Annularia* foliage, and a slab of shale bearing the impression of a very large *Calamites* with side branches, both from Hazelrigg pit.

Samuel Graham.—Nest and eggs of pied wagtail in a paint can, and nest of dipper found on the top of an exposed gatepost at Hallington; also other nests and eggs, including eggs of red-necked phalarope and white variety of redbreast's eggs. Stem of Virginian creeper showing swellings enclosing iron staples.

Jas. Halcrow.—Human skull and limb-bones encrusted with lime, from mines of Thermia, Greece; ornamented bag and woman's costume from Fiji; native fishing spears from Australia; skull of large swordfish, *Histiophorus sp.*, from Madras; skin of young seal from Newfoundland.

Jas. B. Harris.—Piece of manufactured corundum made in electric furnaces at Niagara Falls. Observation-nest of wood ants, *Formica rufa*.

Godfrey Hastings.—An American hawk.

Rev. J. E. Hull, M.A.—Spiders to add to the local collection presented by the same donor in 1895: 110 tubes, bringing up the number of species represented to 160.

Frank M. Littler, F.E.S. (Launceston, Tasmania.)—A set of Tasmanian Lepidoptera: 20 species (54 specimens) set, and 62 species (249 specimens) unset; also 40 tubes of eggs and larvæ in spirit.

Geo. Luckley.—Some mounted seaweeds.

A. E. MacDonald,—A little auk, *Mergulus alle*, found in Northumberland, Jan. 14.

R. H. MacDonald (Dibrugarh, Upper Assam.)—A very fine pair of horns of the takin, *Budorcas taxicolor*, from the Mishmi Hills, Eastern Himalaya.

D. Mallett.—Piece of shale from Main Seam, Hazelrigg pit, showing *Sternbergia* pith lying in wood of *Cordaites*.

Sir Arthur Middleton, Bart.—A female *Sirex gigas* from Belsay.

Capt. P. Mills.—Skin of a South American bittern.

Sir John Murray, K.C.B., F.R.S.—Three plates of Crinoidea from "Challenger" reports (for use in the invertebrate cases.)

Major Geo. J. W. Noble.—Deposited on loan: mounted head of a Chillingham "king bull," shot by the lender, Dec., 1906.

J. J. Oxley.—Some Newfoundland minerals, including azurite in vein-quartz, copper pyrites containing gold, and Belle Isle iron ore.

Percy E. Page (By bequest of the late).—Eleven mammalian skulls: Bengal monkey, *Macacus rhesus*; bonnet monkey, *M. sinicus*; another monkey, *Cercopithecus sp.*; a marmoset, *Hapale sp.*; fruit bat, *Pteropus sp.*; Egyptian and Indian mongoose, *Herpestes ichneumon* and *H. mungo*; coati, *Nasua rufa*; two coypu, *Myopotamus coypu*; common phalanger, *Trichosurus vulpecula*.

M. Pelegrin.—A number of minerals, including ore-samples from Alston and Spain, some agates, and show-specimens of fluorspar, calcite, copper carbonate, malachite, garnet, galena, etc.

Messrs. F. H. Phillips and Co.—Specimens of the common fish-louse, *Lepeophtheirus strömii*, from the tail of fresh-run salmon.

Right Hon. Viscount Ridley.—Natural history objects selected from collections at Blagdon: six birds, including a hawfinch from Blagdon, a pair of ptarmigan, and a golden eagle; a number of tropical and other shells; and a large number of minerals, including volcanic products from Italy, minerals from Alston and Wearhead (good quartz crystals and geodes, "specular" galena, etc.), Ingleton slate with crystalline and dendritic pyrites; also a few fossils, including a fine impression of Lepidodendron on sandstone.

J. D. Robinson.—A human skull; mummified body of a cat.

Ernest Scott.—Skins of four small South American birds—*Pipra rubricapilla* and three humming-birds.

Senckenbergische Naturforschende Gesellschaft in Frankfurt-am-Main.—Large photograph of an Ichthyosaurus in the Senckenberg Museum showing complete imprint of body, fins, and tail.

George Sisson—Four living mole crickets, *Gryllotalpa vulgaris*, from Interlaken. Various shore animals from the Northumberland coast—*Solaster*, *Cribella*, and other starfishes; shanny and other fishes; specimens, one perfect, of the large annelid *Alitta virens*.

Laurence Smith.—Wild bee's nest from Shetland.

C. F. Spence.—Geode with crystals of calcite, from Frenchman's Bay, near South Shields.

B. Storrow.—Various shore animals from near Whitley Bay: 2 *Ligia oceanica*, 2 *Spirontocaris securifrons* 5 *Eolis papillosa*, 1 *Dendronotus arborescens*. Also three uncommon starfishes brought in by trawlers.

THOMAS SUMMERVILLE.—Head of rook with curiously deformed upper mandible, from Denton Burn.

J. H. TANNER.—A tawny owl from Trittington, with rather more white than usual in its plumage.

RONALD TRAIL.—Fossil plants (*Sigillaria*, *Sphenopteris*, *Neuropteris*) from Coal Measures of Germany.

J. URWIN.—Cast of a Cretaceous sea-urchin, *Ananchytes ovatus*, found in glacial gravel on Boldon Flats.

U.S. NATIONAL MUSEUM.—In exchange for local fossils: specimens of the stalked crinoid *Pentacrinus decorus*, Wyv. Th., from off Havana.

WM. WALKER (Amble.)—A piece of shale from the Yard Seam, Broomhill Colliery, Amble, crowded with good scales of *Megalichthys hibberti*.

P. WALTHER.—A large number of minerals, including many samples of metallic ores from Chile, other minerals from English and European localities (including pectolite with clear apophyllite crystals from Wearhead); some Lias fossils from the Yorkshire coast. Also, partly by exchange, an extremely fine piece of pectolite from the whin sill at Wearhead. Two concretions from horses' stomachs, one showing a shoeing nail in the centre. Fifty-seven casts of small cameos from the Capitoline Museum, Rome.

ADDITIONS TO THE LIBRARY

BY EXCHANGE AND DONATION

FROM JULY 1ST, 1907, TO JUNE 30TH, 1908

BRITISH SOCIETIES AND INSTITUTIONS

Berwick-upon-Tweed :—Berwickshire Naturalists' Club.
History of the Club, vol. 19, 1903–1905.

Bolton :—Public Museums and Observatory.
Annual Reports, 1906 and 1907.

Cambridge University :—Philosophical Society.
Proceedings, vol. 14, parts 3–4.
Report for 1906.
List of Members.

Cardiff :—Naturalists' Society.
Transactions, vols. 39, 40.

Dublin :—Royal Dublin Society.
Scientific Transactions, vol. 9, no. 6.
Scientific Proceedings, vol. 11, N.S., nos. 16–20.
Economic Proceedings, vol. 1, nos. 10–11.

Edinburgh :—Geological Society.
Transactions, vol. 9, parts 1, 2.

Hastings :—Corporation Museum.
Annual Report, 1907.

Hull :—Municipal Museum.
Publication no. 50.

Ipswich :—Museum and Free Library.
58th Annual Report, 1907.

Leeds :—Philosophical and Literary Society.
86th and 87th Annual Reports.
Addresses delivered at opening of 58th and 66th Sessions.

Liverpool :—Literary and Philosophical Society.
Proceedings, vol. 60.

Liverpool :—Liverpool University: Institute of Commercial Research in the Tropics.

Quarterly Journal, Index to vol. 1 ; vol. 2, no. 5 ; vol. 3, no. 6.

Paper, "The Commercial Possibilities of West Africa."

London :—British Association for the Advancement of Science.

Report of 77th Meeting, Leicester, 1907.

London :—British Museum (Natural History), South Kensington.

Guide to Great Game Animals.

,, Fossil Invertebrate Animals.

List of British Seed-plants and Ferns.

Special Guide, no. 3—Memorials of Linnæus.

London :—County Council: Horniman Museum.

5th Annual Report.

London :—Quekett Microscopical Club.

Journal, ser. 2, vol. 10, nos. 61, 62.

London :—Zoological Society.

Proceedings, 1907, parts 2–4.

Transactions, vol. 18, part 1.

Maidstone :—Museum, Public Library, and Art Gallery.

Annual Report, 1907.

Manchester :—Literary and Philosophical Society.

Memoirs and Proceedings, vol. 52, parts 1, 2.

Manchester :—Manchester Museum, The University.

Publications, nos. 61, 62.

Reprint, "On the Structure of Syringodendron, the bark of Sigillaria."

Newcastle-on-Tyne :—North of England Institute of Mining and Mechanical Engineers.

Transactions, vol. 55, part 7 ; vol. 56, parts 5, 6 ; vol. 57, parts 4–7 ; vol. 58, parts 1–3.

Annual Report, 1906–7.

Index of Mining, Mechanical and Metallurgical Literature for 1902.

Newcastle-on-Tyne :—Armstrong College.

Calendar, 1907–8.

Newcastle-on-Tyne :—Northumberland Sea Fisheries Committee.

Report on the Scientific Investigations for 1906.

Northampton:—Northamptonshire Natural History Society and Field Club.

Journal, vol 14, nos. 109-112.

Norwich:—Castle Museum.

Annual Report, 1907.

Norwich:—Norfolk and Norwich Naturalists' Society.

Transactions, vol. 8, part 3.

Paisley:—Free Public Library and Museum.

Annual Report, 1906–7.

Plymouth:—Municipal Museum and Art Gallery.

8th Annual Report, 1906–7.

Southport:—Society of Natural History.

12th Report, 1906-7.

Stratford, Essex:—Essex Field Club.

"The Essex Naturalist," vol. 14, part 8; vol. 15, parts 1–3.

Torquay:—Natural History Society.

List of Type-Fossils and Figured Specimens in the Torquay Museum.

Worcester:—Public Library, Museum, and Art Gallery.

Report of Committee, 1906–7.

COLONIAL SOCIETIES AND INSTITUTIONS

Cape Town:—South African Museum.

Report for 1906.

Annals, vol. 5, part 5; vol. 6, part 1.

Ottawa:—Geological Survey of Canada.

Geological Maps, nos. 1–4.

Topographical Maps, nos. 1–4.

Report of Chemistry and Mineralogy (no. 958).

Maps, nos. 887, 889–92, 894, 895, 897, 898, 901, 921, 922, 938, 942 949, 953, 971, 977, 1007.

General Index to Reports, 1885–1906.

Economic Geological Report (no. 992).

Economic Reports, nos. 979, 988.

"The Falls of Niagara," by J. W. W. Spencer, 1905–6.

Annual Report, N.S., vol. 16.

Summary Report (no. 1017) for 1907.

Sydney, N.S.W. :—Australian Museum.
Report of Trustees for 1907.
Records, vol. 6, nos. 5, 6 ; vol. 7, no. 1.

Western Australia :—Geological Survey.
Bulletin, nos. 23–30.
Miscellaneous Reports, nos. 1–8.

AMERICAN SOCIETIES AND INSTITUTIONS

UNITED STATES OF AMERICA

Ann Arbor :—Michigan University, Academy of Science.
9th Annual Report.

Boston :—Society of Natural History.
Proceedings, vol. 33, nos. 3–9.

Boston :—American Academy of Arts and Sciences.
Proceedings, vol. 42, no. 29 ; vol. 43, nos. 1–16.

Brooklyn, N.Y. :—Institute of Arts and Sciences.
Science Bulletin, vol. 1, nos. 11–13.

Buffalo :—Society of Natural Sciences.
Bulletin, vol. 8, nos. 5, 6 ; vol. 9, no. 1.

Cambridge :—Museum of Comparative Zoology, Harvard College.
Bulletin, vol. 48, no. 4 ; vol. 51, nos. 2–12.
Bulletin, Geological Series, vol. 8, nos. 5, 6.
Annual Report of the Curator, 1906-07.
Memoirs, vol. 35, no. 2.
History of Harvard University Museum.
"Louis Agassiz"—Address by Prof. Wm. James.

Chicago :—Field Museum of Natural History.
Publication, nos. 122, 123.
Botanical Series, vol. 2, no. 6.
Geological Series, vol. 2, index and no. 10 ; vol. 3, no. 6.
Annual Report, 1907.

Chicago :—Academy of Sciences.
Bulletin, no. 4, part 2 ; no. 6.

Columbus :—Ohio State University.
Bulletin, vol. 10, no. 4 ; vol. 11, nos. 10, 12, 13, 15.

New York :—Academy of Sciences.
Annals, vol. 17, parts 2, 3 ; vol. 18, part 1.

Philadelphia:—Academy of Natural Sciences.

Proceedings, vol. 59, parts 2, 3.

Philadelphia:—American Philosophical Society.

Proceedings, vol. 46, nos. 185–187; vol. 21, N.S., parts 4, 5.

Washington:—Smithsonian Institution.

Annual Report for 1906.

Miscellaneous Collections, vol. 48, no. 1695; vol. 49, nos. 1720, 1721; vol. 50, nos. 1703, 1772, 1780; vol. 51, no. 1791; Quarterly Issue, vol. 4, part 2.

Contributions to Knowledge, vols. 34, 35.

Annals of the Astrophysical Observatory, vol. 2.

Washington:—Smithsonian Institution, U.S. National Museum.

Report of U.S. National Museum, 1907.

Bulletin, no. 50, part 4; no. 53, part 2; nos. 57–60.

Proceedings, vol. 32.

Contributions from U.S. National Herbarium, vol. 10, parts 4–7.

Washington:—United States Geological Survey.

28th Annual Report, 1906–7.

Mineral Resources of the U.S., 1906.

Bulletins, 287, 294, 296, 300, 304, 308, 309, 312–327, 330, 331, 333, 334, 336, 339.

Professional Papers, 53, 57.

Water-supply Papers, nos. 190–194, 196–210, 213–217.

SOUTH AMERICAN STATES, ETC.

Mexico:—Instituto Geologico.

Boletin, num. 23, text and plates.

Parergones, tomo 2, num. 1–2.

Montevideo, Uruguay:—Museo Nacional.

Anales, vol. 6, tomo 3, entrega 2, 3.

EUROPEAN SOCIETIES AND INSTITUTIONS

Bergen:—Bergens Museum.

Aarbog, 1907, hefte 1, 2, 3; 1908.

Aarsberetning for 1907.

Crustacea of Norway (G. O. Sars), vol. 5, parts 17–20.

Brussels:—Société Royale Malacologique de Belgique.

Annales, tome 41, 1906; tome 42, 1907.

Christiania :—Videnskabs-Selskabet.
Forhandlinger, 1906.

Copenhagen :—Naturhistoriske Forening.
Videnskabelige Meddelelser, 1907.

Frankfurt-am-Main : — Senckenbergische Naturforschende Gesellschaft.
Bericht, 1906–7.
Festschrift zur Erinnerung an die Eröffnung des neuerbauten Museums, 1907.

Hamburg ;—Naturwissenschaftlicher Verein.
Verhandlungen—dritte Folge 14.—1906.
Abhandlungen, vol. 19, parts 1, 2.

Kiew, Russia :—Société des Naturalistes.
Mémoirs, tome 20, part 3.

Lisbon :—Société Portugaise des Sciences Naturelles.
Bulletin, vol. 1, fasc. 1–4.

Paris :—Muséum d'Histoire Naturelle.
Bulletin, 1907, nos. 4 5, 6.

Portici :—R. Scuola Superiore d'Agricolture in Portici.
Bollettino, vols. 1, 2.

Rennes :—Université de Rennes.
Travaux Scientifiques, tome 5, 1906.

Stockholm :—Kongliga Svenska Vetenskaps-Akademien.
Les Prix Nobel en 1905.
Handlingar, vol. 42, nos. 5–9.
Arsbök, 1907.
Arkiv for Botanik, vol. 6, nos. 3–4 ; vol. 7, nos. 1, 2.
,, Zoologi, vol. 3, nos. 3, 4 ; vol. 4, nos. 1, 2.
,, Matematik, Astronomi och Fysik, vol. 3, no. 8 ; vol. 4, nos. 1, 2.
,, Kemi, Mineralogi och Geologi, vol. 2, nos. 4–6 ; vol. 3, no. 1.
Meddelanden, vol. 1, nos. 7–11.

Vienna :—K. k. zoologisch-botanische Gesellschaft.
Verhandlungen, Bd. 57.

MISCELLANEOUS

Reprint of paper by Dr. A. Randell Jackson :—

"A Contribution to the Spider Fauna of the County of Glamorgan." *Presented by the Author.*

Reprint of paper by Prof. F. E. Weiss, D.Sc. :—

"The Parichnos in the Lepidodendraceæ."

Presented by the Author.

Reprint of paper by Miss M. V. Lebour, M.Sc. :—

"The Mussel Beds of Northumberland."

Presented by the Author.

Reprint of paper by Dr. D. Woolacott : —

"The Origin and Influence of the chief Physical Features of Northumberland and Durham." *Presented by the Author.*

"Fauna of British India" Series, as follows :—

Mammals.
Birds, vols. 1-4.
Fishes, vols. 1–2.
Reptilia and Batrachia.
Rhynchota, vols. 1–3, and vol. 4, part 1.
Butterflies, vols. 1–2.
Moths, vols. 1–4.
Hymenoptera, vols. 1–2.
Coleoptera, vols. 1–2.
Arachnida.

Presented by the Secretary of State for India in Council.

"Lepidoptera Indica," 6 vols., by F. Moore, D.Sc.

Presented by Lt.-Col. C. H. E. Adamson, C.I.E.

"Popular History of British Seaweeds," by D. Landsborough.

"Popular History of the Aquarium," by G. B. Sowerby.

"The Aquarium, or Wonders of the Deep Sea," by P. H. Gosse.

"Natural History—Birds," by P. H. Gosse.

"The Seaside Book; an introduction to the Natural History of the British Coasts," by W. H Harvey.

"Lives of Eminent Zoologists from Aristotle to Linnæus," by W. Macgillivray. *Presented by George Luckley.*

"Ootheca Wolleyana," part 4, Alcæ—Anseres, with supplement and appendix. Edited by Prof. A. Newton.

Presented by J. Alaric Richardson.

Prof. W. C. McIntosh, M.D., LL.D.—"The British Annelids," vol, 2, part 1. *From the Ray Society* (by subscription).

"Museums Journal," July, 1907, to June, 1908.

From the Museums Association (by subscription).

"Nature," July 1st, 1907, to June 30th, 1908.

Presented by the Publishers.

THE HONORARY TREASURER IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY

CURRENT ACCOUNT FROM 1ST JULY, 1907, TO 30TH JUNE, 1908

RECEIPTS.	£	s.	d.
Balance, June 30th, 1907	4	15	10
Members' Subscriptions	374	9	6
Museum Admission Fees	165	10	8
Sale of Guide Books	3	2	11
Interest on Investments	163	17	6
Sundries	6	1	8
Deficit	64	14	2
	£782	12	3

PAYMENTS.	£	s.	d.
Salaries	532	12	8
Advertising	9	11	6
Fuel, Lighting, and Water	68	17	0
Insurance	24	14	1
Materials and Fittings	25	3	1
Postage and Carriage	13	4	4
Printing	23	14	2
Property Tax	9	3	4
Building Repair Fund	40	0	0
Stationery	3	2	1
Sundries	32	10	0
	£782	12	3

BUILDING REPAIR FUND

	£	s.	d.
To Cash	40	0	0
	£40	0	0

	£	s.	d.
By Balance overdrawn, June 30th, 1907	5	5	0
,, Sundries	17	19	0
,, Balance, June 30th, 1908	16	16	0
	£40	0	0

SAML. GRAHAM, Hon. Auditor.

A. H. DICKINSON, Hon. Treasurer.

SPECIAL PUBLICATION ACCOUNT

	£	s.	d.
To Balance in Bank, June 30th, 1907	95	16	4
,, Members' Subscriptions	21	11	0
,, Sale of Society's Transactions	17	3	8
,, Interest on Account	0	13	9
	£135	4	9

	£	s.	d.
By Printing and Lithographing	88	8	4
,, Balance in Bank, June 30th, 1908	46	16	5
	£135	4	9

INVESTMENTS

The following is a list of the Investments held by the Society, June 30th, 1908 :—

	£	s.	d.
Newcastle Corporation Irredeemable Stock at $3\frac{1}{2}$ per cent.	2,000	0	0
River Wear Commission Funded Debt at $4\frac{1}{2}$ per cent.	500	0	0
Tyne Commissioners' Consolidated Fund at 4 per cent	2,000	0	0
	£4,500	0	0

SAML. GRAHAM, Hon. Auditor.

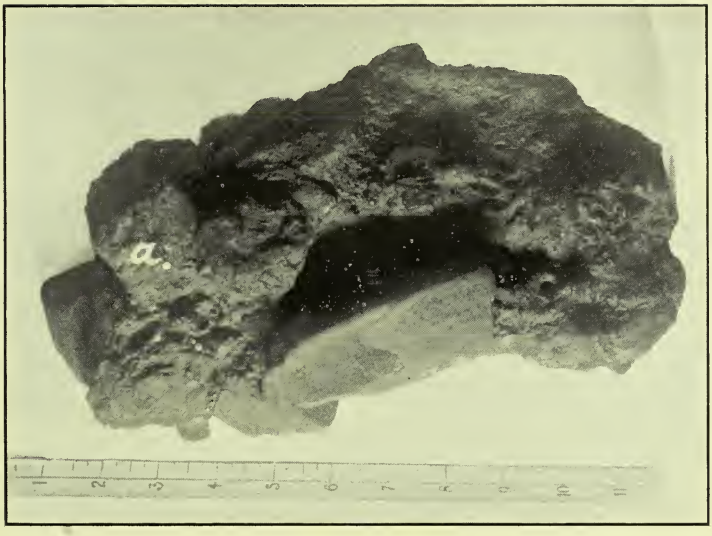
A. H. DICKINSON, Hon. Treasurer.

Note on a recently formed Conglomerate near St. Mary's Island, Northumberland

By David Woolacott, D.Sc., F.G.S.

(Received December 1, 1908)

A little to the north of St. Mary's Island between tide-marks, and extending out beyond low water, there is exposed at present (November, 1908) about a score of patches, totalling several square yards in extent, of a hard cemented conglomerate a few inches thick. It is firmly attached to the bed-rock, and appears to have been only recently uncovered. As many detached pieces are lying about on the shore, it must be undergoing rapid denudation. It is chiefly composed of grains of sand, sandstone and other pebbles, angular fragments of shale, pieces of green apatite, rivets, bolts, and bits of iron plate, the whole being compactly cemented together, and covered with a thin black glaze. After careful searching by Dr. Smythe, G. Weyman, and myself, there were also found firmly set in the deposit a limpet, some lead shot, a brass nail, a corroded and iridescent halfpenny, crystals of calcite filling up holes, many irregular masses of iron pyrites, and some small perfectly formed crystals of the same material. The heterogeneous layer lies almost entirely on the shale which is noted for having cone-in-cone structure developed in it, and is firmly attached to this bed. It is obviously of quite recent origin, the apatite giving a clue to the time during which it has been forming, and the rivets, bolts, and iron plate to the means whereby it has been cemented. Near the place where it occurs a ship called the *Jane Clark*, laden with green apatite from Norway, was wrecked on St. Mary's Island about 1890, and thus the conglomerate with this mineral in it has been produced within the last twenty years. The cementing matter has been largely derived from the corrosion of the pieces of iron occurring in the deposit. Some of the rivets have been



Photograph of a piece of the recently formed Conglomerate near St. Mary's Island, Nov., 1908.

a. piece of Apatite.

almost entirely corroded, and the outer parts of the iron plate oxidised. An analysis of the cementing matter has been made by Dr. J. A. Smythe and found to contain a large quantity of iron, a moderate amount of manganese, with small quantities of aluminium, magnesium, and calcium, and a trace of sodium, combined as carbonates, sulphides, phosphates, and oxides. Silica was also present. The most interesting compound occurring in it would appear to be the large amount of ferrous sulphide. It is hoped to further investigate the chemistry of the deposit.

THE CRUSTACEA OF NORTHUMBERLAND AND DURHAM

By Canon A. M. Norman, M.A., D.C.L., LL.D., F.R.S., and G. Stewardson Brady, M.D., LL.D., D.Sc., F.R.S.

There were no very early students of the Crustacea in these northern counties, and we are not aware of any publications on the subject prior to 1832. The following notes supply a record of all observations and papers up to the year 1862–4, at which time a stimulus was given to the study of this and other branches of Marine Zoology by grants from the British Association. These, with local contributions, enabled dredging to be carried out by means of a steam-tug in the deeper waters which lie off the coast. The earlier papers referred to are as follows :—

Johnston (George), "Illustrations of British Zoology," Loudon's Mag. Nat. Hist., vol. v., 1832. p. 520; vol. vi., 1833, p. 40; vol. vii., 1834, p. 253; vol. viii., 1835, pp. 202, 494, 565, and 668; vol. ix., 1835, p. 80. These papers contained notices of the occurrence of various species of Isopoda, Amphipoda, and parasitic Crustacea, accompanied by illustrations.

Johnston (George), Zoological Journal, vol. iii., 1827, p. 176. *Gammarus maculatus and G. dubius.*

Johnston (George), Proc. Berwickshire Naturalists' Club, vol. i., 1834, "Catalogue of the Cirrhipeda found on the coast of Berwickshire"—6 species.

Embleton (Robert), Proc. Berwickshire Nat. Club, vol. i., 1834, "List of Malacostracan Podophthalma found on the coast of Berwickshire and North Durham." Twenty-eight species are recorded, including description and figure of his new species *Galathea nexa.*

Baird (W.), Hist. Berwickshire Nat. Club, vol. ii., p. 145 (1845?), "Arrangement of the British Entomostraca." In this paper are a few records from Berwick Bay.

Baird (W.), Hist. Berwickshire Nat. Club, vol. ii. (1845?), *Caligus Strömii* described.

Hardy (James), Hist. Berwickshire Nat. Club, vol. iv., p. 212 (1845?), *Pagurus Prideauxii* Leach. "Found in deep water off Burmouth, lodged in a curious domicile formed of a sponge (*Halichondria suberea* Johnston)." It seems probable that the species found was *Pagurus cuanensis*.

Hancock (Albany), Trans. Tyneside Nat. Field Club, vol. i., 1850, and also Ann. and Mag. Nat. Hist., ser. 2, vol. iv., 1849, p. 305; pls. viii., ix., "Notice of the occurrence on the British coast of a Burrowing Barnacle belonging to a new order of the class Cirripedia." The species was named *Alcippe lampas*.

Hancock (Albany), Trans. Tyneside Nat. Field Club, vol. iv., 1858, p. 17, and also Ann. and Mag. Nat. Hist., ser. 3, vol. ii., p. 443, describes the markings on the sand caused by the crawling of the two Amphipoda *Sulcator arenarius* and *Kröyera arenaria*; which Crustacea are described by Spence Bate in the Tyneside Transactions immediately before the paper by Hancock at p. 15, and figured pl. ii., figs. 1 and 2.

Norman (A. M.), Trans. Tyneside Nat. Field Club, vol. iv., 1860, p. 326, pl. xvii., "On an undescribed Crustacean of the genus Mysis."

Norman (A. M.), Trans. Tyneside Nat. Field Club, vol. v., 1860, p. 143, pl. iii., "On species of Ostracoda found in Northumberland and Durham, new to Great Britain."

Hancock (Albany) and Norman (A. M.), Trans. Linn. Soc., vol. xxiv., 1863, p. 49, pls. xv., xvi., "On Splancnotrophus, an undescribed genus of Crustacea, parasitic in Nudibranchiate Mollusca." One of the two species, *Splancnotrophus brevipes*, had been taken on the Northumberland coast.

From this date, when the dredgings, aided by grants from the British Association, were commenced, the Crustacea of the north-east coast began to receive more attention.

The north-east coast of England is not favourable, at any rate in the littoral zone, to the development of the smaller marine animals; the swell which throughout so great a portion of the year beats on the rocky shores leaves little peace for the animals which should live there; while the almost total absence of sheltered bays or even nooks deprives the smaller Crustacea of suitable dwelling places. In years gone by Alder and Hancock made the rocks at Cullercoats famous by the number of interesting Nudibranchiate Mollusca which they discovered there. It is to be feared that they would not have been so successful had they worked there at the present time; the immense increase of population which has taken place north of the entrance to the Tyne, the sewage poured into the water, the vast amount of dredged mud carried out from the Tyne and deposited off shore have greatly changed the condition not only of the shore but of the neighbouring sea from which the Nudibranchs used to make their way landwards at the time of spawning. The North Sea, however, in its deeper parts is excellent dredging ground, whence additions to our fauna have been continually turning up, and where excellent work remains to be done by those who come after us.

We give a comparative table of the Crustacea which have been found on the north-east coast, with those from such other parts of the coasts of Great Britain as have been efficiently worked to a greater or less degree.

The authorities who are responsible for the several columns are as follows :—

1. Northumberland and Durham as in the Catalogue which follows.
2. "Notes on the Crustacea of the Channel Islands," Canon A. M. Norman, Ann. and Mag. Nat. Hist., ser. 7, vol. xx., 1907, p. 356.

3. "The Crustacea of Devon and Cornwall," Canon A. M. Norman and Thomas Scott, LL.D., 1906.

4. "Fourth and Final Report on the Marine Zoology, Botany, and Geology of the North Sea," Report Brit. Assoc., 1890, p. 457. In this report the higher Crustacea are reported on by Mr. A. O. Walker; the Ostracoda by Prof. G. S. Brady, Mr. A. Scott, and Dr. Chaster; the Copepoda by Mr. I. C. Thompson; and the Cirripedia by Mr. Marratt.

5. "Fauna, Flora, and Geology of the Clyde Area, 1901." The Crustacea are reported on by Thomas Scott, F.L.S., p. 328.

6. "A Catalogue of the Land, Freshwater, and Marine Crustacea found in the Basin of the River Forth and its Estuary," by Thomas Scott, LL.D., F.L.S., Proc. Roy. Physical Soc. of Edinburgh, vol. xvi., 1906, p. 97 and p. 267.

7. "Last Report of Dredging among the Shetland Isles." Crustacea by Rev. A. M. Norman, Brit. Assoc. Report (for 1868), 1869, p. 247. The marine species are filled in from this old report, as it is the only one of the fauna of the northern extremity of our Islands; a few additional species have since been discovered, but are not here included. The inland species, however, which have been observed by Dr. T. Scott and R. Duthie have been incorporated. The account of these will be found in *Reports of the Fishery Board for Scotland*, xiii., p. 174; xiv., p. 229; xv., p. 327; and xvi., p. 253.

Crustacea of Northumberland and Durham compared with those of some other parts of the country and seas:—

	Northumberland and Durham.	Channel Islands, 1907.	Devon and Cornwall, 1906.	Irish Sea, 1896.	Firth of Clyde, 1901.	Firth of Forth, 1906.	Shetland. Marine 1868, Inland 1905.
Brachyura	22	39	41	27	29	19	18
Anomura	15	11	16	12	16	15	17
Macrura	22	26	32	22	27	18	20
Schizopoda	14	18	29	16	25	26	11
Stomatopoda	—	1	2	—	—	—	—
Sympoda	26	9	13	17	31	21	12
Isopoda	58	52	68	23	62	44	23
Amphipoda	130	136	144	130	168	145	113
Branchiopoda—							
1. Phyllocarida ...	1	—	1	1	1	—	1
2. Phyllopoda ...	—	—	1	—	—	—	—
3. Cladocera ...	48	—	34	2	51	54	37
4. Branchiura ...	—	—	—	—	1	1	—
Ostracoda	121	64	107	58	142	132	99
Copepoda	163	31	293	195	290	306	70
Cirripedia	17	—	27	10	12	13	6
	637	387	808	513	855	794	427

The character of the fauna of the coasts of Northumberland and Durham is distinctly boreal, and much more northern than that of the same latitude on our western shores. As long ago as 1868 one of us wrote, "The distribution of animal life around our coasts appears for the most parts to have followed the direction south, west, north, and east. It would seem that comparatively few (if any) southern species have made their way far north through the Straits of Dover, which may probably be accounted for by the fact that that channel has, geologically speaking, been only a short time open. As a rule southern species are to be seen at a higher latitude on the western than they are on the eastern coasts. There are, however, some apparent, but only apparent exceptions. These consist of animals known on the north-east coast of Scotland, which we should not have expected to meet with there. On examining into the probable cause of their migration to this district, I am led to believe that they have

made their way thither round the western and northern, and down the eastern coasts to their present habitat, and not up the eastern coast, as at first might have been supposed. For example *Cerithium perversum*, *Phasianella pulla*, *Fissurella græca*, *Tellina balaustina*, *Callianassa subterranea*, *Palmipes placenta*, *Amphiura brachiata*, &c., have been found in the Moray Firth, but are wholly absent on the east coast of England. Moreover many species have been recorded on the Norwegian coast though never found on the eastern shores of England, and therefore may be presumed to have migrated thither up the western side of Great Britain and round the north of Scotland; as examples of such species may be cited *Pleurotoma striolata*, *attenuata* and *septangularis*, *Cerethiopsis tubercularis*, *Cerithium reticulatum* and *perversum*, *Rissoa violacea*, *Pholas dactylus*, *Solen vagina*, *Psammobia costulata*, *Gastrana fragilis*, *Isocardia cor*, *Cardium aculeatum*, *Lepton squamosum*, *Xantho rivulosus*, *Portunus arcuatus*, *Gebia deltura*, &c. On the other hand, while northern forms do not extend southward on the east coast beyond Yorkshire and the Dogger Bank, on the western coast they in many instances have a range southwards to the Nymph Bank off Cork, and even to the Mediterranean Sea."*

Forty years have elapsed since the above was written, and a continued study during that time of the distribution of animal life in the North Atlantic has fully confirmed the views expressed by the writer in the foregoing extract. If re-written now a few names therein quoted as Norwegian would be struck out as erroneously recorded; but the writer would on the other hand be able to add a large number of other species as illustrative of his views. Moreover he has during these years been able to establish a remarkable fact. It is that during the last months of the year, as also during the first months, that is apparently from November to March, enormous quantities of free swimming animals are often brought down from the north along the coasts of Scotland

* Norman (A. M.) "Last Report of Dredging among the Shetland Isles," Rep. Brit. Assoc. (for 1868), 1869, p. 248.

and England; on many occasions as far as north Yorkshire. The species thus occurring are not known (or very rarely?) at other times of the year, and the conclusion the writer arrived at was that at the period of the year mentioned there was a strong southerly current sweeping along our east coast. The Arctic forms which peculiarly distinguish this southerly migration are *Clione limacina* Phipps, *Thysanoessa longicaudata* Kröyer, *Nematoscelis borealis* Norman, and *Euthemisto compressa* Goës.

These conclusions, arrived at on purely zoological grounds, have received remarkable confirmation during the last two or three years from the physical researches of the *International Council for the Exploration of the Sea*. By numerous and extended observations and experiments it has been clearly established that water which enters the North Sea through the Straits of Dover is very soon deflected from its northerly course, and flows eastwards to the continental portion of the area; and that on the other hand strong currents come from the north, along the western side of the channel; and not only so, but that the exact course of these southern-flowing waters, and also the amount of their salinity, varies at different seasons of the year.

The following Crustacea of the orders Brachyura, Anomura, and Macrura, so well known in the south of our islands, are wholly absent from the north-east coast of England:—

* *Ebalia tumefacta* Montagu.
Thia polita Leach.
Polybius Henslowi Leach.
* *Portunus arcuatus* Leach.
Bathynectes longipes Risso.
Xantho floridus Montagu.
* *hydrophilus* Herbst.
Couchii Bell.
Pilumnus hirtellus Pennant.
Nautilograpsus minutus Linné.

* The species in this list to which an * is prefixed have been recorded from the coast of Norway.

* *Pinnotheres veterum* Pennant.
Mamaia squinado Herbst.
Pisa tetraodon Pennant.
biaculeata Montagu.
Macropodia ægyptia H. M. Edwards.
Dromia vulgaris H. M. Edwards.
Pagurus sculptimanus Lucas.
Diogenes pugilator Roux.
Jaxea nocturna Chiereghin.
Axius stirynchus Leach.
Arctus ursus Dana.
Palinurus vulgaris Latreille.
Penæus caramote Risso.
Crangon sculptus Bell.
Alpheus ruber H. M. Edwards.
macrocheles Hailstone.
Hippolyte Prideauxiana Leach.
Typton spongicola O. G. Costa.

On the other hand the only species belonging to these higher Crustacea which live on the north-east coast but are unknown in the south of England are :—

Lithodes maia Leach.
Pagurus pubescens Kröyer.
Anapagurus chiroacanthus Lilljeborg.
? *Spirontocaris securifrons* Norman.
Gaimardi H. M. Edwards.†
Pandalus borealis Kröyer.

We are much indebted to Professor A. Meek for records of Amphipoda and other Crustacea, and to Mr. R. S. Bagnall for the result of his researches among the terrestrial Isopoda; and also to Mr. R. A. Todd, who has added two important species to the local fauna, *Calocaris macandreæ* and *Pandalus borealis*.

* The species in this list to which an * is prefixed have been recorded from the coast of Norway.

† This species has not yet been found on the coasts of Northumberland and Durham, but may be expected to occur there, as Dr. Thomas Scott has recorded it from the Firth of Forth.

The following initials are employed to indicate different collectors in the following report :—

A. Mk=A. Meek.
A. M. N=A. M. Norman.
G. H=George Hodge.
G. S. B=G. S. Brady.
R. H=Richard Howse.

The letters N. and D. after species imply that they have been found on the ("N") Northumberland and ("D") Durham coasts.

CRUSTACEA

Sub-Class I.—DECAPODA Latreille

Order I.—BRACHYURA Lamarck

Section I.—OXYSTOMATA H. Milne-Edwards

Fam. 1.—LEUCOSIADÆ

Ebalia tuberosa (Pennant)=*E. Pennantii* Leach=*E. insignis* Lucas.

Not uncommon in deep water off the coast. N.D.

Ebalia Cranchii Leach=*E. discrepans* Costa=*E. Deshayesii* Lucas=*E. chiragra* P. Fischer.

More common than the last off the north-east coast. N.D.

Fam. 2.—CORYSTIDÆ

Corystes cassivelaunus (Pennant).

The masked crab was repeatedly found by the late Mr. R. Howse cast up upon the strand in the neighbourhood of South Shields; common on the beach at Seaton Carew (G. S. B.); occasionally in great numbers in the bays of Northumberland (A. Mk.). N.D.

Atelecyclus septemdentatus (Mont.)=*Atelecyclus heterodon* Leach.

Occasionally found off our coasts in the coralline zone. N.D.

Section II.—CYCLOMETOPA

Fam. 1.—POLYBIIDÆ

Portumnus latipes (Pennant)=*Portumnus variegatus* Leach.

Two specimens dead on the sands at Whitley (J. Hancock); thrown up in large numbers on the sands between Hartlepool and Black Hall Rocks, Sept., 1861 (A. M. N.). N.D.

Fam. 2.—PORTUNIDÆ Dana

Portunus puber (Linné).

Neighbourhood of Embleton, Northumberland (R. Embleton). Cullercoats, presented by Mr. Henderson, fisherman (Newcastle Museum). Farne Islands, Newbiggin, Whitley, and not uncommon near the Longstone (A. Mk.). N.

Portunus corrugatus (Pennant).

"It has been found by Dr. Johnston in Berwick Bay, but is rare" (Bell, Brit. Crust., p. 96). N.

Portunus depurator (Linné)=*P. plicatus* Risso.

"Occasionally brought from deep water in Embleton Bay, adhering to the nets of the fishermen" (R. Embleton). Sunderland, from trawlers (G. S. B.). N.D.

Portunus marmoreus Leach.

Occasionally met with in the same manner as the preceding (R. Embleton). As Mr. Embleton does not include *P. holsatus* in his list, it is not unlikely that that species may have been mistaken for the present one. N.

Portunus holsatus (Fabricius)=*P. dubius* Rathke.

Frequent in 2–8 fathoms, and occasionally in rock-pools, Ryhope and Seaton Carew (G. S. B.) D.

Portunus pusillus Leach.

Common in the coralline zone. N.D.

Fam. 3.—CARCINIDÆ

Carcinus mænas (Pennant).

Everywhere on the coast. N.D.

Fam. 4.—CANCRIDÆ

Cancer pagurus Linné=*C. fimbriatus* Olivi.

Common. N.D.

Perimela denticulata (Montagu).

A specimen, taken at Whitburn March 1845 by Rev. G. C. Abbs, was in Mr. John Hancock's collection. D.

Section III.—CATAMETOPA

Fam. PINNOTHERIDÆ

Pinnotheres pisum (Linné).

The Pea-crab occurs on our coast chiefly in mussels, but has also been found in *Lævicardium norvegicum*. "By no means uncommon in the mussels obtained at Holy Island and also at Eyemouth" (R. Embleton). Whitburn, 1847, found by Rev. G. C. Abbs and in the collection of the late Mr. John Hancock. In mussels from the mouth of the Tees (G. H.). Druridge Bay (A. Mk.). N.D.

Section IV.—OXYRHYNCHA

Fam. 1.—MACROPODIIDÆ

Inachus dorsettensis (Pennant)=*Cancer scorpio* Fabricius.

Not common, yet frequently met with in deeper water off the coast. N.D.

Inachus dorynchus Leach.

This species seems to be more common than the last in the coralline zone, and has also occurred between tidemarks. N.D.

Macropodia rostrata (Linné)=*Stenorhynchus phalangium* Bell.

Frequent in deep water. N.D.

Macropodia longirostris (Fabricius) = *Stenorhynchus tenuirostris* Bell.

Much rarer than the last, Embleton Bay (R. Embleton); 25–30 fathoms off Seaham (G. H.); off Cullercoats and from Beadnell (A. Mk.). N.D.

Fam. 2.—HYADÆ

Hyas araneus (Linné).

Common in the laminarian and shallower water of the coralline zone. N.D.

Hyas coarctatus Leach.

Frequent in deep water. N.D.

Eurynome aspera (Pennant).

This is *Eurynome scutellata* Risso, *Eurynome boletifera* Costa, and *Eurynome tenuicornis* Malm.

Rather scarce, dredged off Holy Island in 1864 (A. M. N.). Off Seaham (G. H.). Not uncommon in deep water off the Durham coast (G. S. B.). N.D.

Order II.—ANOMURA

Fam. 1.—LITHODIDÆ

Lithodes maia (Linné).

The Northern Stone Crab is captured in the trawls, and also brought in occasionally by the long line fishermen, who draw it up together with many other naturalist's "spolia opima" attached to their hooks. N.D.

Fam. 2.—PAGURIDÆ

Pagurus bernhardus (Linné).

Very common. N.D.

Pagurus pubescens Kröyer=*Pagurus Thompsoni* Bell.

Common in deeper water. N.D.

Pagurus cuanensis W. Thompson.

Rather rare off Northumberland in 1863 and 1864; 7–25 fathoms off Seaham Harbour (A. M. N.); off Ryhope 13–15 fathoms (G. S. B. and G. H.); off South Shields (R. H). N.D.

Anapagurus lævis (W. Thompson).

Off Berwick and other parts of Northumberland coast; and not uncommon in 25 fathoms about six miles off Seaham Harbour (A. M. N.) N.D.

ANAPAGURUS HYNDMANNI (W. Thompson).

Off Berwick and other parts of the Northumberland coast (A. M. N.); 8–10 miles off Seaham Harbour (G. H.); 10–15 miles off Ryhope (G. S. B. and G. H.) N.D.

ANAPAGURUS CHIROACANTHUS (Lilljeborg).

1855. *Pagurus chiroacanthus*, Lilljeborg, Hafs-Crustaceer vid Kullaberg i Skane. Ofvers. Kong. Vet.-Akad. Förh., Arg. 12, No. 3, 1855, p. 118.

1861. *Pagurus ferrugineus*, Norman, Contributions to British Carcinology. Ann. and Mag. Nat. Hist., ser. 3, vol. viii (p. 1 separate copy), October, pl. xiii., figs. 1–3.

1896. *Anapagurus chiroacanthus*, Bouvier, Les Pagurinés des Mers d'Europe. La Feuille des Jeunes Naturalistes, 3me série, 26me année, p. 8, figs. 40, 41.

Off Holy Island and Dunstanburgh, 1864 (A. M. N.) N.

FAM. 3.—PORCELLANIDÆ

PORCELLANA PLATYCHELES (Pennant).

Common under stones between tidemarks. D.N.

PORCELLANA LONGICORNIS (Linné).

1857. *Porcellana priocheles*, Kinahan, Natural Hist. Review, vol. iv., Proc. of Societies, p. 84.

Common in similar situations to the last, and among the roots of *Laminariæ*, and also dredged in 20–30 fathoms. N.D.

FAM. 4.—GALATHEIDÆ

GALATHEA STRIGOSA (Linné).

Seven inches long off Cullercoats (J. Hancock); common at Embleton (R. Embleton); Bamburgh (G. S. B.); Seaham (G. H. and A. M. N.) N.D.

GALATHEA SQUAMIFERA Leach.

Four and three-quarter inches long, Cullercoats (John Hancock); Berwick and Embleton (R. E.); South Northumberland (A. M. N.); Whitburn (G. S. B.); Seaham (G. H.) N.D.

GALATHEA NEXA R. Embleton.

Of this species, originally described by Mr. R. Embleton, three specimens were taken by him at Berwick and one in Embleton Bay. Whitburn, and in cods' stomachs at Hartlepool (A. M. N.); Seaham (G. H.); Skate Roads (A. Mk.) N.D.

GALATHEA INTERMEDIA Lilljeborg.

1851. *Galathea intermedia*, Lilljeborg, Norges Crustaceer. Ofers. K. Vet.-Akad., Förhand., p. 21.

1857. *Galathea Andrewsii*, Kinahan, Nat. Hist. Review, vol. iv., Proc. Soc., p. 157, as *G. nexa*, and p. 228, pl. xvi., figs. 8 a–d. as *G. Andrewsii*.

1861. *Galathea Andrewsii*, Kinahan, Brittannic Species of Crangon and Galathea. Trans. R. Irish Acad., vol. xxiv., p. 95, pl. xi., figs. *ra*, *1a*, *9a*, and pl. xii.

1869. *Galathea intermedia*, Norman, Last Report Dredging Shetland Isles, Brit. Assoc. Rep. for 1868, p. 264.

1882. *Galathea Giardii*, Th. Barrois, Cat. Crust. Podophth. et Echinodermes à Concarneau, p. 22, fig. 2.

1888. *Galathea Parroceli*, Gourret, Revis. Crust. Podopth. Marseille. Annales Mus. Marseille. Zool., p. 110, pl. vi., figs. 11–24.

1888. *Galathea intermedia*, J. Bonnier, Les Galatheidæ des Cotes de France. Bull. Sci. de France et Belgique, vol. xix., p. 44, pl. x., figs. 1, 2, pl. xi., figs. 1–14.

The paper last referred to gives full synonymy and descriptions of the European Galatheidæ.

Cullercoats (J. Alder); off Berwick and other parts of the coast of Northumberland, 1862–4 (A. M. N.); Whitburn (G. S. B); Seaham (G. H.). N.D.

GALATHEA DISPERSA Bate.

1858. *Galathea dispersa*, Bate, Jour. Linn. Soc. Zool., vol. iii., p. 3.

1862. *Galathea dispersa*, Kinahan, Brit. spec. Crangon and Galathea. Trans. R. Irish Acad., vol. xxiv., p. 99, pl. xiii.

1863. *Galathea nexa*, Heller, Die Crustaceen des südlichen Europa, p. 191, pl. vi., fig. 4 (not fig. 3).

1888. *Galathea dispersa*, J. Bonnier, Galatheidæ des cotes de France. Bull. Sci. de France et Belgique, vol. xix., p. 68, pl. xiii., figs. 1–3.

Off different parts of Northumberland, 1862–4 (A. M. N.); Cullercoats (J. Alder); Seaham (G. H.). N.D.

MUNIDA BAMFFIA (Pennant) = *Munida rugosa* Fabricius = *Munida Rondeletii* Bell.

The date of Pennant's specific name is 1777, and that of Fabricius 1787.

Very large, eight inches long, Northumberland (J. Hancock); Cullercoats (J. Alder); Embleton, not uncommon (R. E.); frequent in deep water (A. M. N.); St. Mary's Island (A. Mk.). N.D.

ORDER III.—MACRURA

FAM. 1.—CALLIANASSIDÆ

UPOGEBIA STELLATA (Montagu) = *Gebia deltura* Leach.

Two specimens are in the Newcastle Museum from the Northumberland coast (J. Alder); Whitburn (Mr. Abbs *fide* J. Hancock). N.D.

FAM. 2.—CALOCARIDÆ

CALOCARIS MACANDREÆ Bell.

Dredged by Mr. R. A. Todd (International Fisheries Investigation), July 26, 1907, on mud in 57 fathoms E.N.E. of the Coquet Lighthouse. N.

FAM. 3.—ASTACIDÆ

ASTACUS PALLIPES Lereboullet.

In the rivulets to the south of Berwick Bay (R. Embleton); the Pont near Ponteland, and near Bedlington (John Hancock); tributaries of the Tyne, specimens in Newcastle Museum from Whittle Dene near Ovingham (E. L. Gill). N.

Fam. 4.—HOMARIDÆ

Homarus gammarus (Linné).

Common. N.D.

Nephrops norvegicus (Linné).

Taken abundantly by the trawlers off the coast. N.D.

Fam. 5.—CRANGONIDÆ

Crangon trispinosus Hailstone.

A single specimen taken in the harbour at Holy Island in 3 fathoms, 1862 (A. M. N.); Whitburn sands, July, 1862 (G. S. B.). N.

Crangon fasciatus Risso.

A single specimen dredged in shallow water within the Farne Islands in 1864 (A. M. N.)—but as the difference between this species and *C. neglectus* (G. O. Sars) was not recognised in 1864, the latter may have been mistaken for the former. N.

Crangon neglectus G. O. Sars.

Young specimens dredged in sandy bays of Northumberland (A. Mk.). N.

Crangon bispinosus (Hailstone).

Stomachs of haddock; 40–50 miles E. by N. from Tynemouth, 40 fathoms; off Berwick and off Durham coast, 1864 (A. M. N.). N.D.

Crangon vulgaris (Linné).

In all sandy bays. N.D.

Crangon allmani Kinahan.

1857. *Crangon Allmani*, Kinahan, Nat. Hist. Review, vol. iv., Proc. Societies, p. 80, and woodcuts.

1861. *Steiracrangon Allmani*, Kinahan, Brit. Species Crangon and Galathea. Trans. Roy. Irish Acad., vol. xxiv., p. 65, pl. iii.

Off Berwick in 26–46 fathoms, and off other parts of Northumberland and Durham, 1862–1864 (A. M. N.) N.D.

PONTOPHILUS SPINOSUS Leach.

Frequently taken in 1862–64 off the Northumberland coast, and also 20 miles E. by S. from Tynemouth in 35 fathoms (A. M. N.) N.D.

FAM. 6.—ALPHEIDÆ

ATHANAS NITESCENS (Montagu).

Cullercoats (J. Alder). N.

FAM. 7.—HIPPOLYTIDÆ

SPIRONTOCARIS SECURIFRONS (Norman).

1862. *Hippolyte securifrons*, Norman, Trans. Tyneside Nat. Field Club, vol. v., p. 267, pl. xii., figs. 1–7.

Off the coasts of Northumberland and Durham, frequent, 1862-64 (A. M. N.) N.D.

SPIRONTOCARIS PUSIOLA (Kröyer).

1843. *Hippolyte pusiola*, Kröyer, Monog. fremstilling af Slægten Hippolyte's Nordiske Arter, p. 319, pl. iii., figs. 69–73.

1857. *Hippolyte pusiola*, Kinahan, Nat. Hist. Review, vol. iv., Proc. Societies, p. 159, pl. ix., fig. 2 a–c, pl. x., figs. 9, 10.

Cullercoats and off Northumberland, 1862–63 (A. M. N.); off Ryhope and Seaham (G. H.) N.D.

HIPPOLYTE VARIANS Leach.

Cullercoats, Seaham, and Hartlepool; off Durham and Northumberland coasts, 1862–64 (A. M. N.); Newbiggin and Whitburn (G. S. B.); off Ryhope (G. H.) N.D.

FAM. 8.—PANDALIDÆ

PANDALUS BOREALIS Kröyer.

1835. *Pandalus borealis*, Kröyer, Naturhist. Tidssk., vol. ii., p. 255, and 1845, Anden Rækkes, vol. i., p. 461—Voyages en Scandinavie, &c., pl. vi., fig. 2 a–o.

1851. *Pandalus borealis*, Brandt (F.), Middendorff Siberiske Reise, vol. ii., p. 122.

1879. *Pandalus borealis*, Smith (S. I.), "Stalk-Eyed Crustacea Atlantic Coast of North America," Trans. Connect. Acad., vol. i., p. 86.

1899. *Pandalus borealis*, Sars (G. O.), "Account Post-embryonic Development of *Pandalus borealis*," Rep. Norweg. Fishery and Marine Investigations, vol. i., pls. i–x.

Mr. R. A. Todd has added this very fine Macruran to our fauna. About twenty specimens were taken by the "Huxley" on a muddy bottom in 57 fathoms E.N.E. of the Coquet Light, July 26, 1907, in company with *Ukko Turtoni*, *Calocaris macandreæ*, *Spirontocaris securifrons*, &c.

Pandalus borealis has a wide circumpolar distribution. It is found in the Arctic seas from Greenland in the west to the Kara Sea and Murmar coast in the east. It is met with on the Norwegian coast, and as far south as the Kattegat; on the north-east coast of America as far south as Massachusetts Bay; and in the Pacific off the Island of Unalaska and in the Sea of Okhotsk. N.

PANDALUS MONTAGUI Leach=*P. annulicornis* Leach.

Common. N.D.

PANDALINA BREVIROSTRIS (Rathke).

1843. *Pandalus brevirostris*, Rathke, Beiträge zur Fauna Norwegens, p. 17.

1850. *Pandalus Jeffreysii*, Bate, Notes Fauna of Swansea, Appendix, pl. iv., fig. 2, and 1859, Nat. Hist. Review, vol. vi., Proc. Soc., p. 100, fig. 1.

1853. *Hippolyte Thompsoni*, Bell, Brit. Stalk-eyed Crustacea, p. 290.

1861. *Pandalus Thompsoni*, Norman, Contrib. British Carcinology. Ann. and Mag. Nat. Hist., ser. 3, vol. viii., p. 7 (separate copy), pl. xiv., figs. 3–9.

? 1862. *Pandalus Rathkei*, Heller, Untersuchungen Litoral-fauna Adriatischen Meeres. Sitzungsb. K. Akad. Wissensch., vol. xvi., p. 441, pl. iii., fig. 31.

? 1863. *Pandalus brevirostris*, Heller, Crustaceen des südlichen Europa, p. 247, pl. viii., fig. 9.

? 1883. *Pandalus brevirostris*, A. Milne-Edwards, Recueil de figures de Crustaces nouveaux ou peu connus.

1899. *Pandalina brevirostris*, Calman, On the British Pandalidæ. Ann. and Mag. Nat. Hist., ser. 7, vol. iii., p. 37, pl. i–iv., fig. 4.

We do not feel sure that the species figured by Heller and A. Milne-Edwards is the same as that of Rathke ; the spines on the underside of the rostrum are represented as of much larger size than those which characterize the latter species.

In dredgings off Northumberland and Durham, 1862-64 (A. M. N.); Seaham, 22 fathoms (G. S. B.); Ryhope, 10–15 fathoms (G. H.) N.D.

Fam. 9.—PALÆMONIDÆ

Palæmon serratus (Pennant).

A specimen in the British Museum from Berwick presented by Dr. Johnston (see List Specimens of British Animals in Brit. Mus. Crustacea. 1856, p. 42). N.

Palæmon squilla Leach.

In pools in the bay on the north side of Holy Island, &c. (R. E.); Cullercoats (John Hancock); Whitburn (G. S. B.); Beadnell (A. Mk.) N.D.

Palæmonetes varians (Leach).

Port Clarence and Hartlepool (A. M. N.); Hylton Dene (G. S. B.) D.

Order IV.—SCHIZOPODA

The following works may be consulted with respect to the Mysidea.

1. Sars (G. O.). Carcinologiske Bidrag til Norges Fauna. 1. Monographi over Mysider, pts. i. and ii., Det. Kongl. Norsk. Videnskabss. i Trondhjem, 1870–2, and pt. iii., Universitets-Program. Christiania, 1879.

2. Sars (G. O.). Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna, I. Middelhavets Mysider (Archiv for Mathem. og Naturvid., 1876).
3. Norman (A. M.). British Schizopoda of the Families Lophogastridæ and Euphausiidæ (Ann. and Mag. Nat. Hist., ser. 6, vol. ix., 1892, p. 454), and British Mysidæ, a family of Crustacea Schizopoda (Ann. and Mag. Nat. Hist., ser. 6, vol. x., pp. 143 and 242).

A description of all British species known up to 1892 is to be found in these last papers.

Section I.—EUPHAUSIACEA

Fam. 1.—EUPHAUSIIDÆ

Thysanoessa longicaudata (Kröyer).

1849. *Thysanopoda longicaudata*, Kröyer, Voyages en Scandinavie etc., Crust., pl. viii., fig. 1 a–f.

1882. *Thysanoessa tenera*, G. O. Sars, "Oversigt af Norges Crust. I." (Christ. Vidensk. Forhand.), p. 53 (separate copy), pl. i., figs. 18, 19.

1887. *Thysanoessa longicaudata*, H. J. Hansen, Overs. over det vestlige Grönlands Fauna af malak Havskrebsdyr (Vidensk. Middel. fra den naturf. Foren. i Kjobh.), p. 54 (separate copy).

1892. *Thysanoessa longicaudata*, Norman, Ann. and Mag. Nat. Hist., ser. 6, vol. ix., p. 463, and "The Naturalist," 1892, p. 175.

In "The Naturalist," May, 1892, Mr. Thomas H. Nelson wrote (p. 144) describing what he observed off Redcar, "Feb. 10th, 11th, and 12th, attracted by the number of Kittiwakes *(Rissa tridactyla)* to be seen about a mile out at sea, I procured a boat, and went off to ascertain the cause of this vast assemblage of gulls. Both east and west, as far as the eye could reach, their graceful white forms were visible, many busily engaged dipping into the water, and others flying overhead and then darting down to pick up some object from the surface. I shot two or three examples, and found that their

mouths were full of small Crustaceans, with which the sea was literally alive; heaps of these were afterwards washed ashore by sea-winds, and afforded a feast for starlings and other frequenters of the tidal line."

Mr. Nelson sent to me a small bottle of the specimens from the shore for identification. The mass was composed of *Euthemisto compressa*; but there were also several examples of *Nematoscelis borealis* Norman, and one of *Thysanoessa longicaudata* Kröyer. Mr. Nelson would seem from his description to have seen the Kittiwakes feeding on these Crustaceans off the Durham coast, but at any rate it is certain that these Crustacea came from the north, down the Northumberland and Durham coasts, before they reached the spot where they were cast up upon the strand in the extreme N.E. of Yorkshire. They may be included therefore as occasional visitants off our coasts (A. M. N.) N.D.

NEMATOSCELIS BOREALIS (Norman).

1872. *Thysanoessa borealis*, Norman, in Sim (G.), "Stalk-Eyed Crustacea N.E. Coast of Scotland" (Scottish Naturalist), p. 8 (separate copy).

1882. *Nematoscelis megalops*, G. O. Sars, Prelim. Notices of Schizopoda of "Challenger" Exped. (Christ. Vidensk. Forhand.), p. 27 (separate copy).

1885. *Nematoscelis megalops*, G. O. Sars, Report "Challenger" Exped. Schizopoda, p. 127, pl. xxiii., figs. 5–10, pl. xxiv.

1892. *Nematoscelis megalops*, Norman, Ann. and Mag. Nat. Hist., ser. 6, vol. ix., p. 464.

In my notes in the last-named paper I have referred to some slight differences which appear to exist between the British specimens and that figured by Sars, and should those differences be not truly specific my name *N. borealis* can be adopted. For the occurrence of this species on our coast see notes on the preceding species; considering that there were the remains of several specimens of this species in the very small amount of material which I examined, it would seem to have occurred in great profusion off our coast (A. M. N.) N.D.

Section II.—MYSIDACEA

Fam. 1.—SIRIELLIDÆ

Siriella norvegica G. O. Sars.

Young specimens between tidemarks at Alnmouth (G. S. B.) N.

Siriella jaltensis Czerniavsky.

This is *S. crassipes* of G. O. Sars. Cullercoats (A. M. N.); St. Mary's Island, Craster, and Holy Island (A. Mk.) N.

Siriella armata (H. Milne-Edwards).

This would appear to have been *Mysis Griffithsiæ* of Bell and *Mysis producta* of Gosse.

Young specimens taken at Alnmouth (G. S. B.); Cullercoats, St. Mary's Island, Alnmouth Bay, and Holy Island (A. Mk.) N.

Fam. 2.—GASTROSACCIDÆ

Gastrosaccus spinifer (Goës).

Off the mouth of the Tees, May, 1866 (Mr. Davison *fide* G. S. B.); Cullercoats (A. Mk.) N.D.

Fam. 3.—LEPTOMYSIDÆ

Mysidopsis didelphys (Norman).

Forty to fifty miles off Tynemouth, 1862 (A. M. N.) N.

Leptomysis lingvura G. O. Sars.

Cullercoats and Seaham (A. M. N.); Whitburn (G. S. B.); Cullercoats (A. Mk.) N.D.

Fam. 4.—MYSIDÆ

Hemimysis lamornæ (Couch).

Seaham, July, 1861 (G. H.); Cullercoats and Craster (A. Mk.) N.D.

Macromysis flexuosa (Müller).

Common; tidemarks and shallow water. N.D.

Macromysis inermis (Rathke).

Cullercoats (A. M. N.); Sunderland (G. S. B.); abundant at Cullercoats, St. Mary's Island, and Craster (A. Mk.) N.D.

SCHISTOMYSIS SPIRITUS Norman.

Black Hall Rocks near Hartlepool, and off Northumberland and Durham, 1862 (A. M. N.); Cambois Bay (A. Mk.) N.D.

SCHISTOMYSIS ORNATA (G. O. Sars).

Seaham and other parts of the coast. N.D.

NEOMYSIS VULGARIS (Thompson).

River Lyne (Northumberland), Hartlepool, Port Clarence (A. M. N.); Hylton Dene (G. S. B.) N.D.

SUB-CLASS II.—EDRIOPHTHALMA

ORDER V.—SYMPODA Stebbing

=CUMACEA Auct.

The chief works with relation to the British Sympoda are :—

1. Sars (G. O.). Nye Bidrag tel Kundskaben om Middelhavets Invertebratfauna, II. Cumacea (Archiv. f. Mathemat. og Naturvid. vol. iv.), 1879.
2. Sars (G. O.). Account Crustacea of Norway, vol. iii., Cumacea, 1900.

The name Cuma of Humphreys, 1795, being in use for a genus of Mollusca, the Rev. T. R. R. Stebbing has discarded it among the Crustacea, substituting for it *Bodotria* Goodsir, and for the Order Cumacea the more appropriate name Sympoda.

FAM. 1.—BODOTRIIDÆ

BODOTRIA ARENOSA Goodsir.

1843. *Bodotria arenosa*, H. Goodsir, Edinb. New Philos. Journ., vol. xxxiv., p. 9 (separate copy), pl. iii., figs. 8–13, pl. ii., fig. 17. ♂

1853. *Bodotria arenosa*, Bell, Brit. Stalk-Eyed Crust., p. 332. ♀

1866. *Cuma pusilla*, G. O. Sars, Beretning om en i Sommeren, 1865, foretagen Zoologisk Reise, p. 26.

1899. *Cuma scorpioides*, G. O. Sars, Crustacea Norway, vol. iii., Cumacea, p. 10, pls. i., ii., iii.

Thirty miles off Sunderland in 45 fathoms (G. S. B.) D.

Bodotria scorpioides (Montagu).

1808. *Cancer (Astacus) scorpioides*, Montagu, Trans. Linn. Soc., vol. ix., p. 70, pl. vi., fig. 5.

1843. *Cuma Edwardsii*, H. Goodsir, Edinb. New Philos. Journ., vol. xxxiv., p. 5 (separate copy), pl. ii., figs. 1–13, 18, pl. iv., fig. 11.

1853. *Cuma Edwardsii*, Bell, Brit. Stalk-Eyed Crust., p. 326, and woodcuts under *Cuma Audouinii*, p. 328 (*not those under C. Edwardsii*, which are *C. Audouinii*).

1869. *Cuma scorpioides*, Norman, Last Report Dredging Shetland. Brit. Assoc. Report for 1868, p. 273.

1879. *Cuma Edwardsii*, G. O. Sars, Nye Bidrag til Kundskaben von Middelhavets Invertebratfauna, II. Middelhavets Cumaceer, p. 10, pls. i., ii., iii.

1899. *Cuma Edwardsii*, G. O. Sars, Crustacea Norway, vol. iii., Cumacea, p. 12, pl. iii.

Off Seaham (G. H., 1861); off Sunderland and off Tynemouth in 25 fathoms (G. S. B.); Holy Island and Cullercoats (A. Mk.) N.D.

Bodotria pulchella (G. O. Sars).

1879. *Cuma pulchella*, G. O. Sars, Nye Bidrag til Kundskaben von Middelhavets Invertebratfauna, II. Middelhavets Cumaceer, p. 24, pl. vi. ♂, and pl. lx. ♀.

A single specimen taken by G. S. B. off Sunderland. D.

Iphinoë trispinosa (H. Goodsir).

1843. *Cuma trispinosa*, H. Goodsir, Edinb. New Philos. Journ., vol. xxxiv., p. 8 (separate copy), pl. iii., figs. 1–7.

1853. *Cuma trispinosa*, Bell, Brit. Stalk-Eyed Crust., p. 329.

1856. *Halia trispinosa*, Bate, The British Diastylidæ, Ann. and Mag. Nat. Hist., ser. 2, vol. xvii., p. 458, pls. xiv. and xv., fig. v.

1856. *Iphinoë trispinosa*, Bate, Ann. and Mag. Nat. Hist., ser. 2, vol. xviii., p. 187.

1856. *Venilia gracilis*, Bate, as above, vol. xvii., p. 460, pl. xv., fig. vii. ♂.

1856. *Cyrianassa gracilis*, Bate, as above, vol. xviii., p. 187 ♂.

1869. *Iphinoë gracilis*, Norman, Last Report Dredging Shetland. Brit. Assoc. Report for 1868, p. 272 ♂.

1899. *Iphinoë trispinosa*, G. O. Sars, Crust. Norway, Cumacea, p. 14, pls. v. and vi.

Off Seaton Carew in 14 fathoms (G. S. B.); Cullercoats (A. Mk.) N.D.

Fam. 2.—VAUNTHOMPSONIIDÆ

Vaunthompsonia cristata Bate.

1858. *Vaunthompsonia cristata*, Bate, Nat. Hist. Review, vol. v., p. 203.

1879. *Vaunthompsonia cristata*, G. O. Sars, Middelhavets Cumaceer, p. 65, pls. xxiii.–xxvi.

Fifty to sixty miles E. by N. from Tynemouth, 1862 (A. M. N.) N.

Fam. 3.—LAMPROPIDÆ

Hemilamprops rosea (Norman).

1862. *Vaunthompsonia rosea*, Norman, Tyneside Nat. Field Club, vol. v., p. 271, pl. xiii., figs. 1–3. ♀

1862. *Cyrianassa elegans* id. ibid., p. 275, pl. xiv., figs. 1–6 ♂.

1899. *Hemilamprops rosea*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 22, pl. xii., xiii., xiv.

Fifty to sixty miles E. of Tynemouth, and 100 miles E. by N. from Tynemouth in 25–30 fathoms (A. M. N.); twenty-nine miles off Alnmouth in 59 fathoms, and thirty miles off Sunderland in 45 fathoms (G. S. B.) N.D.

Fam. 4.—LEUCONIDÆ

Leucon nasicus Kröyer.

1841. *Cuma nasica*, Kröyer, Naturhist. Tidsskrift, vol. iii., p. 524, pl. vi., figs. 31–33, and *Leucon nasicus*, Voyage en Scandinavie, &c., pl. iii., fig. 2.

1897. *Leuconopsis ensifer*, Walker (A. O.), "New Species of Edriophthalma from the Irish Sea," Linn. Soc. Journ., Zool., vol. xxvi., p. 227, pl. xvii., fig. 1–1h. ♂

1900. *Leucon nasicus*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 30, pls. xxi., xxii.

Twenty-nine miles off Alnmouth in 59 fathoms, and thirty miles off Sunderland in 45 fathoms (G. S. B.). The Leucon recorded by G. S. B. (Nat. Hist. Trans. Northumberland, Durham, and Newcastle, vol. xiv., p. 94) as *L. nasicoides* proved to be not that species, but a slight variety of the present one. N.D.

Eudorella emarginata (Kröyer).

1846. *Leucon emarginatus*, Kröyer., Naturhist. Tidsskrift Anden Rækkes, vol. ii., p. 181, pl. i., fig. 7, and pl. ii., fig. 3; and Voyages en Scandinavie, &c., pl. v. (2), fig. 2.

1862. *Cyrianassa ciliata*, Norman, Tyneside Nat. Field Club, vol. v., p. 273, pl. xiii., figs. 4–9 ♂.

1900. *Eudorella emarginata*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 36, pls. xxvii., xxviii.

One hundred miles E. of Tynemouth in 20–25 fathoms and off Durham coast (A. M. N.); 20–30 miles E. of Alnmouth, 50–59 fathoms (G. S. B.) N.D.

Eudorella truncatula (Bate).

1856. *Eudora truncatula*, Bate, "On the British Diastylidæ," Ann. and Mag. Nat. Hist., ser. 2, vol. xvii., p. 457, pl. xiv., fig. iii.

1867. *Eudorella truncatula*, Norman, Brit. Assoc. Report for 1866, p. 197, note.

1877. *Eudorella inermis*, Meinert, Crust. Isop. Amphip. et Decapod. Daniæ, p. 183 ♂.

1879. *Eudorella truncatula*, G. O. Sars, Middelhavets Cumaceer, p. 86, pls. xxx.–xxxii.

1900. *Eudorella truncatula*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 36, pls. xxvii–xxviii.

Fifty to sixty miles E. of Tynemouth (A. M. N.); E. of Alnmouth in 39 fathoms, and 5–17 miles off Souter Point in 30–39 fathoms (G. S. B.) N.D.

EUDORELLOPSIS DEFORMIS (Kröyer).

1846. *Leucon deformis*, Kröyer, Naturhist. Tidsskrift. Anden Rækkes, vol. ii., p. 194, pl. ii., fig. 4; and Voyages en Scandinavie, &c., pl. v. (2), fig. 3.

1900. *Eudorellopsis deformis*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 40, pls. xxxi., xxxii.

In surface-net near Sunderland (G. S. B.); Cullercoats (A. Mk.) N.D.

FAM. 5.—DIASTYLIDÆ

DIASTYLIS RATHKEI (Kröyer).

1841. *Cuma Rathkei*, Kröyer, Naturhist. Tidssk., vol. iii., p. 513, pls. v., vi., figs. 17–30, and ser. 2, vol. ii., pp. 144 and 207, pl. i., figs. 4, 6; and Voyages en Scandinavie, &c., pl. v., fig. 1.

1846. *Cuma angulata*, Kröyer, Naturhist. Tidssk., ser. 2, vol. ii., p. 156, pl. ii., fig. 1; and Voyages en Scandinavie, &c., pl. v., fig. 2, ♂.

1853. *Alauna rostrata* (Goodsir), Bell, Brit. Stalk-Eyed Crustacea, p. 330*.

1856. *Diastylis Rathkei*, Bate, British Diastylidæ, Ann. and Mag. Nat. Hist., ser. 2, vol. xviii., p. 451, pl. xiii., figs. 1–21.

1869. *Diastylis spinosa*, Norman, Last Report Shetland Dredging, Brit. Assoc. Rep. for 1868, p. 271, ♂.

1878. *Diastylis bimarginatus*, Bate, "Two new Crustacea from the Coast of Aberdeen," Ann. and Mag. Nat. Hist., ser. 5, vol. i., p. 409, and vol. iii. (1879), p. 93, ♂.

1878. *Diastylis bimarginatus*, G. Sim, Ann. and Mag. Nat. Hist., ser. 5, vol. ii., p. 453.

1900. *Diastylis Rathkei*, G. O. Sars, Crust. Norway, vol. iii., Cumacea, pp. 44 and 107, pls. xxxiii., xxxiv., lxx.–lxxiii. ♂ ♀.

Off Seaham Harbour in 5–8 fathoms (G. H., 1861, and A. M. N., 1863); 20–30 miles off Newbiggin in about 40

* See notes on this in Norman and Scott, "Crustacea of Devon and Cornwall," 1906, p. 31.

fathoms, and in several dredgings off Souter Point in 21–39 fathoms (G. S. B.) N.D.

DIASTYLIS BRADII Norman, Plates viii., ix.

1879. *Diastylis Bradii*, Norman, Crustacea Cumacea of the "Lightning," "Porcupine," and "Valorous" Expeditions, Ann. and Mag. Nat. Hist.. ser. 5, vol. iii., p. 57.

1888. *Diastylis Bradii*, A. O. Walker, Proc. Biol. Soc. Liverpool, vol. ii., p. 178, pl. xii., figs. 10, 11.

Female.—Body moderately robust; carapace with dorsal margin little arched, the depth not very unequal throughout, about equal in length to the free segments of the trunk; anterior portion of body subequal in length to the tail exclusive of the telson. Carapace with the lateral margin minutely serrated throughout almost its entire length; surface beset with spines of very small and subequal size; these minute spines are in certain places arranged in regular lines, and thus become more conspicuous and map out the carapace into areas. These lines of spines are chiefly as follows: an arched row situated about the middle of the length of the carapace passes from the lateral margin with a curve to the dorsal line in front of this another row passing upwards from the lateral margin bifurcates, the hinder branch passing round the back of the stomachic region; the other branch is directed forward to the rostrum, just before the extremity of which it dies out. There are also two transverse rows which cross the back of the stomachic region.

The anterior free segments of the trunk have their front dorsal margin minutely crenulated; the last segment is rather widely separated from the preceding, and has its anterior margin cut into teeth which alternate with conspicuous plumose setæ; the epimera of this segment are in both sexes produced backwards into large acute processes.

The tail has a series of small spines on the lower lateral margin of the segments. The antennæ reach beyond the rostrum by the length of the last very long joint of the peduncle; flagellum as long as the last joint of the peduncle;

shorter flagellum small, equal in length to first joint of the longer flagellum.

The first feet have their basal joint spinose all over, and the basal joint of the palp is also spinose; the penultimate and antipenultimate joints are subequal, and the last joint nearly as long as the preceding. The basal joint of all the following feet is also spinose, but not so strongly as that of the first pair.

The telson has about 14–19 spines on each side. Uropods with 20–25 spines on the peduncle; inner branch with first joint bearing 9–11 spines on the inner margin; the second 3–4, the third 3–6 and terminal spines. Length, 11–12 mills.

The adult *male* has the raised line which in that sex commonly occupies a longitudinal position on the side of the carapace only slightly developed, and it is not until a high power of the microscope is used that it is seen to bear very minute spines. The legs are very spiny. The upper and lower lateral margins of the segments of the tail are strongly spined. The telson has only about nine slender spines on each side; it equals in length the peduncle of the uropods.

This species was first dredged by the "Porcupine" in 1869 in 15 fathoms in Lough Swilley, Co. Donegal. Mr. A. O. Walker has taken it in the Irish Sea. A. M. N. has found it to be not uncommon at Plymouth.

On the Durham coast it was dredged in shallow water off Seaton Carew (A. M. N.) D.

Diastylis cornuta (Boeck).

1863. *Cuma cornuta*, Boeck, Christiania Vid.-Selsk. Forhand., p. 190.

1864. *Diastylis bispinosa*, G. O. Sars (nec Stimpson), Om de aberrante Krebsdyrgruppe Cumacea, Vid.-Selsk. Forhand., p. 39.

1865. *Diastylis bicornis*, Bate, Ann. and Mag. Nat. Hist., ser. 3, vol. xv., p. 84, pl. i., fig. 2.

1869. *Diastylis bispinosa*, Norman, Last Report Shetland Dredging, Brit. Assoc. Rep. for 1868, p. 270.

1900. *Diastylis cornuta*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 45, pls. xxxv. and xxxvi.

A single specimen taken off Whitley in 20 fathoms (G. S. B.) N.

DIASTYLIS RUGOSA G. O. Sars.

1864. *Diastylis rugosa*, G. O. Sars, Aberrante Krebsdyr-gruppe Cumacea, Vid.-Selsk. Forhand., p. 41 ♀.

1879. *Diastylis strigata*, Norman, Crustacea Cumacea of "Lightning," &c., Ann. and Mag. Nat. Hist., ser. 5, vol. iii., p. 62 ♂.

1900. *Diastylis rugosa*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 48, pl. xxxvii.

Off Durham coast (A. M. N.), off Whitley in 20 fathoms (G. S. B.) N.D.

DIASTYLIS LÆVIS Norman.

1869. *Diastylis lævis*, Norman, Last Report Shetland Dredging, Brit. Assoc. Report for 1868, p. 270.

1879. *Diastylis lævis*, Norman, Crustacea Cumacea of "Lightning," &c., Ann. and Mag. Nat. Hist., ser. 5, vol. iii., p. 60.

1900. *Diastylis rostrata*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 51, pl. xxxix. (not of Goodsir, which is *D. Rathkei*).

1906. *Diastylis lævis*, Norman and Scott, Crustacea of Devon and Cornwall, p. 31.

Off Marsden and off Holy Island (A. M. N.); off Whitley, 20 fathoms (G. S. B.); Cullercoats (A. Mk.) N.D.

DIASTYLIS TUMIDA (Lilljeborg).

1855. *Cuma tumida*, Lilljeborg, Ofvers. Vet.-Akad. Förhand., p. 119.

1900. *Diastylis tumida*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 52, pl. xi.

Off Whitley, 20 fathoms, and 30 miles off Sunderland (G. S. B.) N.D.

DIASTYLIS LUCIFERA (Kröyer).

1841. *Cuma lucifera*, Kröyer, Naturhist. Tidsskrift, vol. iii., pp. 527 and 531, pl. vi., figs. 34, 35; and Voyages en Scandinavie, &c., pl. iii., fig. 3.

1900. *Diastylis lucifera*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 49, pl. xxxviii.

Off Marsden and off Tynemouth (A. M. N.); 29 miles E. of Alnmouth in 59 fathoms, off Souter Point in 39 fathoms, and off Hawthorn 25 fathoms (G. S. B.) N.D.

Diastyloides biplicata G. O. Sars.

1864. *Diastylis biplicata*, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea, Vid.-Selskab. Forhand., p. 46.

1867. *Diastylis lamellata*, Norman, Brit. Assoc. Report for 1866, p. 200.

1879. *Diastylis Calveri*, Norman, Crustacea Cumacea of "Lightning," &c., Ann. and Mag. Nat. Hist., ser. 5, vol. iii., p. 63 ♂.

1900. *Diastyloides biplicata*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 62, pl. xlvi.

Off Tynemouth (A. M. N.). About 30 miles off Alnmouth in 39 fathoms; off Souter Point, 39 fathoms; and 25 miles off Sunderland, 45 fathoms (G. S. B.) N.D.

Leptostylis ampullacea (Lilljeborg).

1855. *Cuma ampullacea*, Lilljeborg, Ofvers. Vet. Akad. Förhand., p. 120.

1864. *Diastylis ampullacea*, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea, Vid. Selskab. Forhand., p. 50.

1900. *Leptostylis ampullacea*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 70, pl. l., fig. 1.

In a depth of 40 fathoms 30 miles off Sunderland (G. S. B.) N.

Fam. 6.—PSEUDOCUMIDÆ

Pseudocuma longicornis (J. V. Thompson).

1856. *Cyrianassa longicornis* (J. V. Thompson) Bate, Ann. and Mag. Nat. Hist., ser. 2, vol. xvi., p. 187.

1860. *Leucon cercaria*, Van Beneden, Recherches sur la Faune littorale de Belgique, Crustacés, p. 85, pl. iv.

1864. *Pseudocuma bistriata*, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea, Vid. Selskab. Forhand., p. 70.

1877. *Cuma bella*, Meinert, Crust. Isop. Amphip. et Decap. Daniæ. Naturhist. Tidsskrift 3, R., vol. xi., p. 179.

1900. *Pseudocuma cercaria*, G. O. Sars, Crust. Norway, vol. iii., Cumacea, p. 74, pls. li., lii.

Off Seaham and off Newbiggin (A. M. N.); off Alnmouth, Souter Point, Hawthorn, and Seaton Carew (G. S. B.); Druridge Bay and Cullercoats (A. Mk.) N.D.

Pseudocuma similis G. O. Sars.

1900. *Pseudocuma similis*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 76, pl. liii.

Off Marsden, Co. Durham, in 28 fathoms (G. S. B.) D.

Petalosarsia declivis (G. O. Sars).

1864. *Petalopus declivis*, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea, Vid. Selsk. Forhand., p. 72.

1882. *Petalomera declivis*, G. O. Sars, Oversigt Norges Crustaceer I., Christ. Vid. Selsk. Forhand., p. 58.

1893. *Petalosarsia declivis*, Stebbing, History of Crustacea, p. 308.

1900. *Petalosarsia declivis*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 77, pl. liv.

About 30 miles off Alnmouth in 39-57 fathoms, and off Souter Point in 37 fathoms (G. S. B.) N.

Fam. 7.—NANNASTACIDÆ

Cumella pygmæa G. O. Sars.

1864. *Cumella pygmæa*, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea, Vid. Selsk. Forhand., p 74.

1869. *Cumella agilis*, Norman, Last Report Dredging Shetland, Brit. Assoc. Rep. for 1868, p. 272 ♂.

1878. *Cumella pygmæa*, G. O. Sars, Nye Bidrag tel Kundskaben Middelhavets Invertebratfauna, II., Middelhavets Cumaceer, Archiv. f. Mathem. og Naturvid., p. 146, pls. l.–li.

1900. *Cumella pygmæa*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 81, pl. lv.

Newbiggin and Seaham (A. M. N.); off Whitley and off Sunderland (G. S. B.) N.D.

CAMPYLASPIS RUBICUNDA (Lilljeborg).

1852. *Cuma rubicunda*, Lilljeborg, Hafs-Crustaceer vid Kullaberg. Ofvers. Kongl. Vet. Akad. Förhand., p. 121.

1864. *Campylaspis rubicunda*, G. O. Sars, Om en aberrante Krebsdyrgruppe Cumacea, Vid. Selsk. Forhand., p. 77.

1900. *Campylaspis rubicunda*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 84, pls. lvi., lvii.

Off Souter Point, 39 fathoms, and off Hawthorn, 25 fathoms (G. S. B.) D.

CAMPYLASPIS GLABRA G. O. Sars.

1878. *Campylaspis glabra*, G. O. Sars, Nye Bidrag til Kundskaben om Middelhavets Fauna, II., Middelhavets Cumaceer, Archiv. f. Mathemat. og Naturvid., p. 129, pls. xliv.–xlvii.

1900. *Campylaspis glabra*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 86, pl. lviii.

About 30 miles off Alnmouth in 39 fathoms; 5–6 miles off Souter Point, 30 fathoms; off Marsden, 28 fathoms (G. S. B.) N.D.

CAMPYLASPIS COSTATA G. O. Sars.

1864. *Campylaspis costata*, G. O. Sars, Om den aberrante Krebsdyrgruppe Cumacea, Vid. Selsk. Forhand., p. 79.

1894. *Campylaspis costata*, Norman, A Month on the Trondhjem Fiord, Ann. and Mag. Nat. Hist., ser. 6, vol. xiii., p. 277, pl. xii., fig. 9.

1900. *Campylaspis costata*, G. O. Sars, Crust. Norway, iii. Cumacea, p. 87, pl. lx.

About 30 miles off Alnmouth, 39–59 fathoms; and off Souter Point, 39 fathoms (G. S. B.) N.D.

[*Leucon nasicoides* and *Dactylopsis resima* were recorded (Nat. Hist. Trans. North., Dur., and Newcastle, vol. xiv., p. 94) by mistake from the coast].

Order VI.—ISOPODA Latreille

The arrangement and nomenclature here employed is that of G. O. Sars' Account of the Crustacea of Norway, vol. ii., Isopoda, 1896-1899. Where necessary, however, references are given.

Section I.—CHELIFERA G. O. Sars

Fam. 1.—TANAIDÆ

Tanais Cavolinii H. Milne-Edwards.

1828. *Tanais Cavolinii*, H. Milne-Edwards in Audouin et Milne-Edwards, Précis d'Entomologie, vol. i., pl. xxxi., fig. 2.

1840. *Tanais Cavolinii*, H. Milne-Edwards, Hist. Nat. des Crustacés, vol. iii., p. 141, pl. xxxi., fig. 6.

1842. *Tanais tomentosus*, Kröyer, Naturhist. Tidsskrift, vol. iv., p. 183; and Voyages en Scandinavie, &c., pl. xxvii., fig. 2.

1843. *Crossurus vittatus*, Rathke, Beitrag zur Fauna Norwegens, p. 35, pl. i., figs. 1–7.

1866. *Tanais vittatus*, Bate and Westwood, vol. ii., p. 125.

1875. *Tanais vittatus*, Macdonald, External Anatomy of Tanais vittatus, &c. Trans. Linn. Soc., Zool., ser. 2, vol. i., p. 67, pl. xv.

1896. *Tanais tomentosus*, G. O. Sars, Crust. Norway, ii. Isopoda, p. 12, fig. 15.

1897. *Tanais Cavolinii*, A. Dollfus, Note Prelim. Tanaidæ de l' "Hirondelle." Bull. Soc. Zool. France, vol. xxi. p. 207.

1898. *Tanais Cavolinii*, A. Dollfus, Campagnes de la "Melita," Tanaidæ. Mem. Soc. Zool. France, vol. xi., p. 35.

1899. *Tanais Cavolinii*, Norman, Ann. and Mag. Nat. Hist., ser. 7, vol. iii., p. 332.

In 1866 G. O. Sars (Nye Bidrag til Kundskaben om Middelhavets Invertebratfauna, iii. Middelhavets Saxisopoder, Archiv. f. Mathemat. og Naturvid., p. 312, pl. ix., figs. 1–3)

described the Tanais which has *four-jointed* uropods under the name *Tanais Cavolinii* Milne-Edwards; but A. Dollfus has shown that Milne-Edwards' species is that which has *three-jointed* uropods, and must take precedence of the synonyms given above. To a *four-jointed* uropod species A. Dollfus has given the name *A. Chevreuxi*; and this would seem to be *T. Cavolinii* G. O. Sars. The present species is also *Tanais hirticaudatus* of Bate.

Berwick Bay (Dr. G. Johnston); Cullercoats (G. S. B.). N.

Tanaissus Lilljeborgii (Stebbing).

1891. *Leptognathia Lilljeborgii*, Stebbing, "Sessile-Eyed Crustacea." Ann. and Mag. Nat. Hist., ser. 6, vol. viii., p. 325. pl. xvi.

1897. *Leptognathia crassimana*, Dollfus (A.), Campagnes de la "Melita," Tanaidæ. Mem. Soc. Zool. France, vol. xi., p. 46 ♂.

1906. *Tanaissus Lilljeborgii*, Norman and Scott, "The Crustacea of Devon and Cornwall," p. 34, pl. i., figs. 1–7.

Off North Sunderland and Seaton Carew in 4 fathoms (G. S. B.). N.D.

Leptognathia filiformis (Lilljeborg).

Off Northumberland coast between St. Mary's Island and Souter Point, 1904 (G. S. B.) N.

Leptognathia breviremis (Lilljeborg).

In the same dredgings as the last (G. S. B.) N.

Leptognathia longiremis (Lilljeborg).

With the two preceding species (G. S. B.) N.

Leptognathia brevimana (Lilljeborg).

About 30 miles off Alnmouth in 57 fathoms, and 5–6 miles off Souter Point in 30 fathoms, both ♂ and ♀ (G. S. B.) N.

[Bate and Westwood record *Apseudes Latreillii* from Northumberland from A. M. N. It was a *lapsus* on their part. The specimen sent to them was labelled "Moray Firth."]

Section II.—FLABELLIFERA G. O. Sars

Fam. 1.—GNATHIIDÆ

Gnathia maxillaris (Montagu).

This is *Anceus maxillaris* ♂ and *Praniza cœruleata* ♀ of Bate and Westwood; but not *Gnathia maxillaris* of G. O. Sars (see Norman and Scott's "Crustacea of Devon and Cornwall," 1906, p. 36, pl. ii., figs. 1–8).

Not rare off the coasts of the two counties. N.D.

Fam. 2.—ÆGIDÆ

Ægа psora (Linné).

A specimen taken off the N.E. coast is (or was) in the Newcastle Museum. N.(D?)

Ægа monophthalma Johnston.

1834. *Ægа monophthalma* (larger form), Johnston, Loudon's Mag. Nat. Hist., vol. vii., p. 233, figs. a, b.

Johnston procured three specimens attached to a large codfish taken in Berwick Bay. One of these specimens is in the British Museum, "Berwick Bay (on codfish), presented by Dr. G. Johnston"; another specimen is in the British Museum, "Northumberland, presented by R. Howse, Esq."; a third specimen is in the Newcastle Museum labelled "Presented by W. Hutchenson, Whitburn"; a fourth specimen was procured by Mr. G. Abbs at Whitburn, and came into the possession of Mr. A. Hancock, who gave it to A. M. N. N.D.

Ægа Strœmii Lütken.

1834. *Ægа monophthalma* (smaller form), Johnston, Loudon's Mag. Nat. Hist., vol. vii., p. 233, fig. c.

1843. *Ægа bicarinata*, H. Rathke, Beit. zur Fauna Norwegens, p. 25, pl. vi., figs. 1–18 (but not *Ægа bicarinata* Leach).

1858. *Ægа Strœmii*, Lütken, Vid. Medd. Nat. For. Kjobenhavn, p. 68, pl. i. a, figs. 6–8.

1906. *Ægа Strœmii*, Norman and Scott, "Crustacea of Devon and Cornwall," p. 38, pl. viii., figs. 9, 10.

In *Æga bicarinata* Leach the eyes are widely separated, in *Æga Strœmii* they meet each other. Bate and Westwood (vol. ii., p. 281) erroneously regarded the *Æga monophthalma*, smaller form, as a variety to *Æga tridens* Leach.

A specimen is in A. M. N.'s collection which was taken at Whitburn, May 18, 1849, by Mr. Abbs, and given to Mr. Hancock, who kindly added it to A. M. N.'s collection. A second specimen is in the Newcastle Museum. Bate and Westwood (vol. ii., p. 280) erroneously referred the Whitburn specimen above-named, which was sent to them for their use, to *Æga bicarinata.* N.D.

Section III.—VALVIFERA G. O. Sars

Fam. 1.—IDOTEIDÆ

Idotea balthica (Pallas)=*I. tricuspidata* Bate and Westwood.

For synonyms see G. O. Sars' Crust. Norway, vol. ii., Isopoda. Frequent on and off the coast in shallow water. N.D.

Idotea neglecta G. O. Sars.

Two quite young specimens, only 4 millims. long, appear to be referable to this species. Cullercoats (G. S. B.) N.

Idotea granulosa Rathke.

1843. *Idotea granulosa*, H. Rathke, Beit. z. Fauna Norwegens, p. 23.

1895. *Idotea marina*, A. Dollfus, Les Idoteidæ des cotes de France, Feuille des Jeunes Naturalistes, ser. 3, 25 année, p. 7, fig. 22.

1897. *Idothea granulosa*, G. O. Sars, Crust. Norway, ii. Isopoda, p. 82, pl. xxxiv., fig. 1.

Hartley, tidemarks, common (A. M. N.)

Dr. Brady has also found this species in one or two places on the coast, and it is doubtless common between tidemarks, but has been confounded with *I. balthica.* N.D.

Idotea emarginata (Fabricius).

Seaham (A. M. N.); Roker and Whitburn from fishing boats (G. S. B.) N.D.

IDOTEA LINEARIS (Linné).

Seaham in 10 fathoms, 1861 (G. H.) D.

Professor Sars has changed the usual spelling of this genus *Idotea* to *Idothea*. Such a change is not desirable, first because Fabricius spelt his genus *Idotea**, and secondly because there is a genus *Idothea* among the Mollusca.

FAM. 2.—CIROLANIDÆ

EURYDICE PULCHRA Leach.

Occasionally taken in the tow-net in sandy bays near shore. It seems to be more gregarious in habits than are the more recently described species of the genus, which moreover are usually found in deeper water. N.D.

FAM. 3.—LIMNORIIDÆ

LIMNORIA LIGNORUM (Rathke).

A very elaborate paper was published in 1893 by Dr. P. P. C. Hoeck on the structure of this species, and on the damage done by it in Holland†. It is common on the Northumberland and Durham coasts, and often does much injury to piles, etc. N.D.

FAM. 4.—ARCTURIDÆ

ASTACILLA LONGICORNIS (Sowerby).

The *Arcturus gracilis* of Goodsir and of Bate and Westwood is the male of this species.

Not uncommon off the coast. N.D.

ASTACILLA INTERMEDIA (Goodsir).

1841. *Arcturus intermedius*, H. Goodsir, Edinb. New Philos. Jour., vol. xxxi., p. 309, pl. vi., figs. 1–3.

1867. *Arcturus intermedius*, Bate and Westwood, Brit. Sessile-eyed Crustacea, vol. ii., p. 271.

* It is curious that Fabricius (Ent. Syst. Supp., 1798) in the body of his work spells his genus *Idotea*, but in the index it appears as *Idothea*.

† Report der Commissie uit de Koninklige Akademie von Wetenschappen. *Limnoria lignorum*. Amsterdam, 1893.

1869. *Arcturus affinis*, G. O. Sars, Nye Dybvands-crustaceer fra Lofoten. Chr. Vid. Selsk. Forh., p. 163 (p. 19 separate copy).

1897. *Astacilla affinis*, G. O. Sars, Crust. Norway, vol. ii., Isopoda, p. 90., pl. xxxvii., fig. 2.

Dr. Henderson has recorded the occurrence of this species in the Firth of Forth, which is the locality whence the types of Goodsir came; he writes, "N.E. of Inchkeith in the Firth of Forth, April, 1884, attached to spines of *Echinus esculentus*. Colour pale white, transparent, the distal end of joints of antenna banded with green; green bands (faint) on anterior segments of body." This observation is interesting in connection with the fact that this Astacilla was taken in considerable numbers near the Farne Islands in 1863 clinging to the test of *Strongylocentrotus drœbachiensis* (Müller). The year previously this species had been taken off Tynemouth (A.M.N.)

N.

Arcturella dilatata G. O. Sars.

Souter Bank in 39 fathoms, and 32 miles E. of Alnmouth in 40 fathoms (G. S. B.) N.D.

Section IV.—ASELLOTA

Fam. 1.—ASELLIDÆ

Asellus aquaticus (Linné).

In lakes and streams. N.D.

Fam. 2.—JANIRIDÆ

Janira maculosa Leach.

In the coralline zone, not rare. N.D.

Jæra marina (Fabricius).

This is *Jæra albifrons* of Bate and Westwood. It is common under stones between tidemarks.

N.D.

Fam. 3.—MUNNIDÆ

Munna limicola G. O. Sars.

Off Seaham Harbour (G. H.); 2½ miles off Souter Point in 21 fathoms (G. S. B.); Bate and Westwood (vol. iv., p. 328)

refer some *Munna* which A. M. N. sent them from Cullercoats and Seaham to *Munna Krœyeri*; but as far as the Seaham specimens were concerned certainly erroneously (A. M. N.) D.

Munna Fabricii Kröyer.

Thirty-four miles E. of Alnmouth in 39 fathoms, and off Souter Point in the same depth (G. S. B.) N.D.

Paramunna bilobata G. O. Sars.

Twenty-nine miles E. of Alnmouth, 59 fathoms; and 5-6 miles off Souter Point in 50 fathoms (G. S. B.) N.D.

Pleurogonium rubicundum G. O. Sars.

Two and a half miles off Souter Point, 21 fathoms; off Marsden 30 fathoms, and off Sunderland in 40 fathoms (G. S. B.) N.D.

Pleurogonium spinosissimum G. O. Sars.

1899. *Pleurogonium spinosissimum*, Th. Scott, "Report Marine and Freshwater Crustacea from Franz-Josef Land." Jour. Linn. Soc., Zool., vol. xxvii., p. 67, pl. iii., fig. 15.

A half-grown specimen apparently referable to this species, but with characters not fully developed, dredged off Souter Point. The metasome is as in Scott's figure, more contracted distally and more pointed at the extremity than in the figure given by Sars (G. S. B.) N.

Pleurogonium inerme G. O. Sars.

Dredged in about 25 fathoms off Northumberland coast between St. Mary's Island and Souter Point, 1904 (G. S. B.) N.

Fam. 4.—MUNNOPSIDÆ

Pseudarachna hirsuta G. O. Sars.

Twenty-nine miles E. of Alnmouth, 59 fathoms, and off Souter Bank, 39 fathoms (G. S. B.) N.D.

Eurycope mutica G. O. Sars.

Twenty to thirty miles E. of Alnmouth in 50–60 fathoms (G. S. B.) N.

Section V.—SPHÆROMIDEA

Fam. 1.—SPHÆROMIDÆ

Sphæroma rugicauda Leach.

Wansbeck, Seaton Sluice, Hartlepool, Port Clarence (A. M. N.); Hylton Dene (G. S. B.) N.D.

Section VI.—ONISCOIDEA

Mr. R. S. Bagnall, of Winlaton-on-Tyne, has during the last two years worked at this tribe energetically and with great success. He has kindly placed the results of his investigations at our disposal.

Fam. 1.—LIGIIDÆ

Ligia oceanica Linné.

Rocks, at and above high-water mark, common. N.D.

Fam. 2.—TRICHONISCIDÆ

Trichoniscus pusillus Brandt.

This species, which is the *Philougria riparia* Bate and Westwood, is frequent among damp leaves and moss. N.D.

Var. violaceus Schöbl?

1861. *Trichoniscus violaceus*, Schöbl, Korysi stejnonozi (Crustacea Isopoda) ohledem na rody a druhy v Cechách se nalézající (Ziva. Casopis Prérodnicky, p. 310, V. Praze).

Mr. Bagnall writes of the Trichoniscus here referred to, "It is always met with in exceedingly moist situations, and in its movements differs from *T. pusillus*. It was first met with by Mr. Gill and myself in the moss of a waterfall, and among refuse at the foot of the same over which water continually drops, at Gibside; and subsequently it was found at another waterfall in Gibside. Also a single specimen from a well in a garden at Winlaton; and others from under stones in a small stream at Scaur Banks, near Winlaton Mill; and under stones in a similar situation at Hart, near Hartlepool." It was also taken a great many years ago by A. M. N. in a very damp

situation by the side of the stream which runs into Seaton Sluice, Northumberland. Under stones on the sea banks at Fulwell and Ryhope (G. S. B.) N.D.

TRICHONISCUS PYGMÆUS G. O. Sars.

1898. *Trichoniscus pygmæus*, G. O. Sars, Crust. Norway, vol. ii., Isopoda, p. 162, pl. lxxii., fig. 2.

1906. *Trichoniscus pygmæus*, Bagnall (R. S.), Ann. and Mag. Nat. Hist., ser. 7, vol. xviii., p. 474.

1907. *Trichoniscus pygmæus*, Bagnall (R. S.), Ann. Soc. Royale Zoologique et Malacologique de Belgique, xlii., pp. 263–266.

Gardens at Winlaton, where it is common; Gibside, Ravensworth, Egglestone-in-Teesdale; in flower-pots at South Hylton; and in Northumberland in gardens, Leazes Park and Hancock Museum grounds, Newcastle; Butcher Hill, near Matfen; Wylam, and Alnwick. Mr. Bagnall, who gives all the foregoing localities, adds "I have found it on several occasions away from cultivated ground." N.D.

TRICHONISCUS STEBBINGI Patience.

1907. *Trichoniscus Stebbingi*, Patience (A.), Journ. Linn. Soc., Zool., vol. xxx., p. 42, pl. vii., figs. 1–7.

1908. *Trichoniscus Stebbingi*, Bagnall (R. S.), Ann. Soc. Royale Zoologique et Malacologique de Belgique, xliii., pp. 127–129.

A single specimen in an orchid house belonging to Mr. Cookson at Wylam, and also a few examples in hothouses at Alnwick and Newcastle-upon-Tyne (Bagnall). N.D.

TRICHONISCUS INTERMEDIUS n. sp. (provisional), Bagnall.

"Two examples taken amongst herbage on Butcher Hill Farm, near Matfen, in September, 1906, but unfortunately so mutilated about the abdomen as to defy description. The locality is seven or more miles over a hilly road from the nearest station, and I have not been able to search for further examples. The telson is identical with that of *pusillus*, to which species it bears the strongest resemblance; but the

antennæ are like those of *vividus*, Koch; the flagellum 5–7 jointed, and the peduncle very smooth, without the spines which characterize the peduncle of *pusillus*.' (Bagnall). N.

TRICHONISCUS ROSEUS (Koch).

Four specimens of the white variety under a stone in the grounds of the Hancock Museum at Newcastle; and richly coloured examples with *Cylisticus*, *T. pygmæus*, etc., at Alnwick: also rarely in a garden at Winlaton and in the winter gardens, Sunderland (Bagnall). N.D.

TRICHONISCOIDES ALBIDUS (Budde Lund).

1885. *Trichoniscus albidus*, Budde Lund, Crust. Isopoda terrestria, p. 248.

The *Trichoniscoides albidus* G. O. Sars would seem to be a different species from that of Budde Lund.

Carley Hill Quarry near Sunderland, 1904 (G. S. B.). Two examples in a garden at Winlaton. A few examples with *Trichoniscus roseus* and *T. pygmæus* at Alnwick, which were of a beautiful and pronounced yellowish-pink colour when alive (Bagnall). N.D.

HAPLOPHTHALMUS MENGII (Zaddach).

1898. *Haplophthalmus Mengii*, Sars (G. O.). Crust. Norway, vol. ii., Isopoda, p. 167, pl. lxxiv., fig. 1.

1906. *Haplophthalmus Mengii*, Webb and Sillem, The British Woodlice, p. 26, pl. vii.

This is *Haplophthalmus elegans* of Schöbl.

Fulwell Quarry, near Sunderland (G. S. B.) Under stones in garden and field at the Groves, Winlaton, with *T. pygmæus*. In gardens and cool greenhouse Leazes Park, Newcastle, and under stone in grounds of the Hancock Museum. On one occasion in the open country (Bagnall). N.D.

HAPLOPHTHALMUS DANICUS, Budde Lund.

1898. *Haplophthalmus danicus*, Sars (G. O.), Crust. Norway, vol. ii., Isopoda, p. 165, pl. lxxiv., fig. 2.

1906, *Haplophthalmus danicus*, Webb and Sillem, The British Woodlice, p. 27, pl. viii.

Humbleton Hill, near Sunderland (G. S. B.). A mature male and young under a piece of wood in a garden at Wylam-on-Tyne, and in numbers Leazes Park, Newcastle, where they occurred in the gardens as well as in the cooler houses (Bagnall). N.D.

Fam. 3.—ONISCIDÆ

Oniscus asellus Linné.

Everywhere. N.D.

Philoscia muscorum (Scopoli).

Sedgefield (A. M. N.); Humbleton Hill, Cleadon, and Carley Hill Quarry near Sunderland, Stocksfield, and Ratcheugh Crag (G. S. B.). Mr. Bagnall has taken it in a great many localities in our two northern counties. He writes to us "Generally common under stones in hedgerows, and amongst dry grass, vegetable matter, etc. A very dark and almost unicolorous form is found under stones in gardens; a totally yellow variety in damp moss of waterfalls (Gibside, Durham, and Saltburn, Yorkshire). A number sent to me from the south of England are of a beautiful pink colour, exhibiting no trace of brown. All our Northumberland and Durham specimens are much darker than the southern examples, with the exception of the yellow variety; and none of them exhibit the slightest trace of pink or red in their coloration." N.D.

Philoscia Patiencei Bagnall.

1908. *Philoscia Patiencei*, Bagnall (R. S.), Ann. and Mag. Nat. Hist., ser. 8, vol. i., pp. 428–451, pl. xviii.

After describing this small species of *Philoscia*, which was discovered in large numbers in a hothouse at Kew, Mr. Bagnall writes, "On examining the species something in its general facies appealed to me as being familiar, and I remembered a few examples of a puzzling form which I had found with *Trichoniscus pygmæus*, Sars, in a garden at Winlaton, Co. Durham. This form was entered in my diary for October, 1906, and February, 1907, as "*Trichoniscus dilaticornis*, sp. nov.?" but, as the specimens were undoubtedly immature,

I put them away, and they thus escaped my memory. I was very interested therefore to find upon re-examination that the species was apparently conspecific with the one just described, or, at least, very closely allied to it."

When alive *P. Patiencei* bears a very strong superficial resemblance to the ubiquitous *Trichoniscus pusillus*, both in its general appearance and movements. N.D.

Platyarthrus Hoffmanseggii Brandt.

1898. *Platyarthrus Hoffmanseggi*, Sars (G. O.), Crust. Norway, vol. ii., Isopoda, p. 175, pl. lxxvi., fig. 2.

1906. *Platyarthrus Hoffmanseggii*, Webb and Sillem, The British Woodlice, p. 30, pl. xii.

Carley Hill Quarry, near Sunderland (G. S. B.). Two examples with *Myrmica rubra* at Chopwell, and several with the same ant at Greatham, near Hartlepool (Bagnall). D.

Porcellio scaber Latreille.

Very common, "Including varieties *marmorata* and *marginata* of Brandt and Ratzeburg, the latter variety very rare. Also a large form, bright red in colour, which might be called var. *rufa*, a single specimen Winlaton, and three examples sent to me by Mr. Donisthorpe, taken in the nest of the red ant *Formica sanguinea*. A small variety is found in colonies in the busiest parts of the nests of the wood ant *Formica rufa* at Corbridge-on-Tyne; it is much smaller than the type, the dorsal surface not so scabrous, cephalic lobe less pointed, and distal joint of the flagellum longer in relation to basal joint; but as the sexual characters, etc., on dissection, entirely agree with *P. scaber*, it would be better to regard it as a form of that species, most likely produced after several generations of life with the ants; it might bear the distinguishing name var. *Darwiniana*. On two occasions I have found colonies almost identical with the last living under stones in rock-pools of salt water and entirely submerged; and when disturbed they merely ran along the bed of the pool to seek shelter under another submerged stone or piece of weed" (Bagnall). N.D.

Porcellio pictus Brandt and Ratzeburg.

1898. *Porcellio pictus*, Sars (G. O.), Crust. Norway, vol. ii., Isopoda, p. 177, pl. lxxviii., fig. 1.

1906. *Porcellio pictus*, Webb and Sillem, The British Woodlice, p. 33, pl. xiv.

A few in the Hancock Museum grounds, Newcastle. Several examples in garden and cellars, and a small colony under a stone in quarry at Winlaton. Common under stones near inn at Egglestone-in-Teesdale, also under bark of logs laid for firewood; and at Corbridge (Bagnall). N.D.

Porcellio dilatatus Brandt.

Several taken in rubbish heap behind Hancock Museum, Newcastle; a few in orchid houses at Wylam; common at Alnwick; swarming in cold greenhouses at Winlaton, and also in propagating houses Ravensworth, and in Leazes Park, Newcastle-on-Tyne (Bagnall). N.D.

Porcellio Rathkei Brandt.

1853. *Porcellio trivittatus*, Lereboullet, Mem. Crust. Fam. Cloportides (Mem. Soc. Nat. Hist. Strasbourg), p. 54, pl. i., figs. 13, 14, pl. iii., figs. 66–70.

1898. *Porcellio Rathkei*, Sars (G. O.), Crust. Norway, vol. ii., Isopoda, p. 180, pl. lxxix., fig. 1.

1906. *Porcellio Rathkei*, Webb and Sillem, The British Woodlice, p. 34, pl. xvi.

Near Winlaton Mill, Stocksfield, and Humbledon Hill near Sunderland (G. S. B.). A single example under stones in meadow at Lockhaugh near Rowlands Gill (Bagnall). N.D.

Porcellio lævis Latreille.

One adult and three young under stone on rubbish heap behind the Hancock Museum, Newcastle-upon-Tyne (Bagnall). N.

Metoponorthus pruinosus (Brandt).

1868. *Porcellio pruinosus*, Bate and Westwood, vol. ii., p. 487.

1898. *Metoponorthus pruinosus*, Sars (G. O.), Crust. Norway, vol. ii., Isopoda, p. 184, pl. lxxx., fig. 2.

1906. *Metoponorthus pruinosus*, Webb and Sillem, The British Woodlice, p. 37, pl. xix.

Garden, Burnmoor Rectory, co. Durham (A. M. N.). In numbers swarming with *P. scaber* in heap of garden rubbish, Hancock Museum grounds, Newcastle. Alnwick, common. One specimen in a quarry near the village of Winlaton, where also it occurred in a cellar, and swarming in old greenhouses with *Porcellio dilatatus*; Axwell Park, near Blaydon; a colony under large stone near the salt-works at Greatham (Bagnall). N.D.

Cylisticus convexus (De Geer).

1868. *Porcellio armadilloides*, Bate and Westwood, vol. ii., p. 485.

1898. *Cylisticus convexus*, Sars (G. O.), Crust. Norway, vol. ii., Isopoda, p. 186, pl. lxxxi.

1906. *Cylisticus convexus*, Webb and Sillem, The British Woodlice, p. 39, pl. xxi.

Several specimens at Alnwick in fernery, and a solitary example crawling on the footpath at Monkseaton near Whitley Bay, Northumberland. A single example in a manure heap, Axwell Park, November, 1908 (Bagnall). N.D.

Fam. 4.—ARMADILLIDIIDÆ

Armadillidium vulgare (Latreille).

Widely distributed, but not nearly so common as it is in the south of England. N.D.

Armadillidium pulchellum Brandt.

1892. *Armadillidium pulchellum*, Dollfus (A.), Tableaux synoptiques de la Faune Française. Le genre Armadillidium. Feuille des Jeunes Naturalistes, p. 14 (separate copy).

1898. *Armadillidium pulchellum*, Sars (G. O.), Crust. Norway, vol. ii., Isopoda, p. 191, pl. lxxxiii., fig. 4.

1906. *Armadillidium pulchellum*, Webb and Sillem, The British Woodlice, p. 42, pl. xxiv.

This species is apparently fond of dry situations. Near Stocksfield, Devil's Water (G. S. B.). Two adult and many young under a stone at Winlaton. Found in colonies of the black ant (*Formica fusca*) at Hedley, near Stocksfield, and near Ebchester in the Derwent Valley (Bagnall). N.D.

Armadillidium nasatum Budde Lund.

1892. *Armadillidium nasatum*, Dollfus (A.), Tableaux synoptiques de la Faune Française. Le genre Armadillidium. Feuille des Jeunes Naturalistes, p. 10 (separate copy).

1899. *Armadillidium nasatum*, Norman (A. M.), British Land Isopoda. Ann. and Mag. Nat. Hist.. ser. 7, vol. iii., p. 75, pl. vi., figs. 5–8,

1906. *Armadillidium nasatum*, Webb and Sillem, The British Woodlice, p. 40, pl. xxii.

Common in Mr. Cookson's orchid house at Wylam-on-Tyne; garden and cool greenhouse in Leazes Park, Newcastle-upon-Tyne; and a few taken at Alnwick (Bagnall). N.D.

Section VII.—EPICARIDA

Fam. 1.—PHRYXIDÆ

Phryxus abdominalis Kröyer.

Bate and Westwood write, "Mr. Alder has obligingly forwarded to us a specimen of the male on *Hippolyte Barleei* taken at Cullercoats on the Northumberland coast." N.

Fam. 2.—BOPYRIDÆ

Pleurocrypta longibranchiata (Bate and Westwood).

This is *Phryxus longibranchiatus* B. and W. (vol. ii., p. 246). They write "The Rev. A. M. Norman announces it from a specimen of *Pagurus Thompsoni* dredged off Tynemouth, August, 1863." The specimen thus recorded had been examined and named by Mr. Bate, the name at that time being a MS. one. It and specimens recorded by Bate as taken on *Galathea squamifera* belonged probably to different

species. The specimen from the Northumberland coast remained in Mr. Bate's possession, so that it must be doubtful what it really was. Sars suggests, and perhaps rightly, that it was *Pseudione Hyndmanni* (Bate) (G. O. Sars, Crust. Nor., Isop., p. 207, cf. p. 203).

[It may be here mentioned that while the work of Bate and Westwood was in course of publication, species of Amphipoda and Isopoda, which could not be identified, were sent to Mr. Bate for use in his work. Manuscript names of some of these, including that of the foregoing parasitic Isopod, as well as *Heiscladus longicaudatus* and *Nœnia caudadentata* were sent by Mr. Bate, and entered in the lists (Nat. Hist. Trans. North. and Dur., vol. i., 1865, p. 25), but the descriptions were never published, nor were the specimens returned. They were presumably lost, as Mr. Bate was usually very exact in the return of specimens.]

Order VI.—AMPHIPODA

Prof. A. Meek has during the last few years been doing excellent work on the Amphipoda, and the following list will show how much it owes to his researches (see Report on Scientific Investigations of Northumberland Sea Fisheries Committee, 1891, and Nat. Hist. Trans. Northumberland, Durham, and Newcastle-upon-Tyne, vol. xiv., pt. 1, p. 57); but many of his records are now first given here. At p. 256 the number of Amphipods from the two counties is given as 130, but it will be found that in the following notes more than that number are recorded; additional species having been discovered by Professor Meek.

Section I.—HYPERIIDEA

Fam. 1.—HYPERIIDÆ

Hyperia galba (Montagu)=*Lestrigonus exulans* and *Kinahani* B. & W. ♂

Occasionally taken off the coasts of Northumberland and Durham. N.D.

HYPEROCHE TAURIFORMIS (Bate and Westwood)=*H. Kröyeri* Bovallius and G. O. Sars.

Young and adult specimens have been obtained nearly every year in the surface nets at the trawling excursions; and washed up in abundance in Cullercoats Harbour, March, 1903 (A. Mk.) N.D.

EUTHEMISTO COMPRESSA (Goës).

1878. *Lestrigonus spinidorsalis*, Bate, Ann. and Mag. Nat. Hist., ser. 5, vol. i., p. 411, fig. 2.

Professor Meek tells us that he has taken typical specimens of this species off Northumberland. N.

EUTHEMISTO GRACILIPES (Norman).

1863. *Hyperia oblivia*, Bate and Westwood, vol. ii., p. 16 (but not of Kröyer).

1869. *Hyperia gracilipes*, Norman, "Last Report Dredging Shetland." Brit. Assoc. Rep. for 1868, p. 287.

1887. *Parathemisto longipes*, Bovallius, "Syst. List of Amphip., Hyperiidea." Bihang t. K. Sv. Vet.-Akad. Hand., vol. xi., no. 16, p. 21.

1889. *Parathemisto gracilipes*, Bovallius, "Contrib. to Monog. of Amphip., Hyperiidea." K. Sv. Vet.-Akad. Hand., vol. xvii., no. 7, p. 368.

1906. *Euthemisto gracilipes*, Norman and Scott, The Crustacea of Devon and Cornwall, p. 54.

There are some Arctic Amphipods which reach the British Isles, but which are there of very much smaller size and less pronounced characters; by some naturalists these are regarded as distinct species, by others as varieties. *Euthemisto gracilipes* is such a form. It differs from *E. compressa* in its very small size, and the absence of dorsal spinose keels. Although we have given it as a species, we really regard it as a depauperized form of *E. compressa*. British writers, following the mistake of Bate and Westwood, have frequently recorded it as *Parathemisto oblivia*. From that species it may at once be distinguished by the carpus of the first two pairs of peræopods, which are ovately formed, and wider than the preceding joint.

Druridge Bay, 1896, Cambois Bay, 1898, and subsequently at other places on the Northumberland coast (A. Mk.). Mr. Thomas H. Nelson, the ornithologist, has observed this *Euthemisto* cast up at Redcar, Yorkshire, in the most extraordinary quantity on several occasions in the early part of the year, the first time being April 4, 1892.* These shoals must have come from the north past Northumberland and Durham. N.D.

Section II.—GAMMARIDEA

Fam. 2.—ORCHESTIIDÆ

Talitrus locusta (Pallas).

High-water mark among decaying weeds, sandy shores, common. N.D.

Hyale Lubbockiana (Bate)=*Allorchestes imbricatus.*

"Coast of Northumberland by Mr. Joshua Alder" (Bate and Westwood). N.

Hyale Nilssoni (Rathke).

Common amongst the rocks, especially under the little masses of mussels at Cullercoats and Whitley near high-water mark (A. Mk.) N.D.

Orchestia littorea (Montagu).

Common high-water mark among pebbles mixed with sand. *Orchestia brevidigitata* B. and W., vol. ii., p. 277, is the young of this species. N.D.

Orchestoidea Deshayesii (Audouin).

Abundant among pebbles high-water mark at Ryhope (A. M. N.) D.

Fam. 3.—LYSIANASSIDÆ

Lysianassa plumosa Boeck.

1861. *Lysianassa Costæ*, Bate and Westwood vol. i., p. 74 ♀.

1861. *Lysianassa longicornis*, Bate and Westwood (partim), vol. i., p. 85 ♂.

* See Norman, The Naturalist, 1892, p. 175, and refer to what has been written under *Thysanoessa longicaudata*, p. 271.

1870. *Lysianassa plumosa*, Boeck, Crust. Amphip. Bor. et Arct., p. 14 ♂.

1893. *Lysianassa septentrionalis*, Della Valle, Fauna und Flora des Golfes von Neapel, p. 775.

This does not seem to be the *Lysianassa Costæ* of Milne-Edwards, and Della Valle re-named it; but Boeck's name must take precedence.

A single specimen from coast of Northumberland sent by Mr. Alder (Bate and Westwood). N.

Lysianassa ceratina (Walker).

1889. *Lysianax ceratinus*, Walker, "Third Report on Higher Crustacea." Fauna of Liverpool Bay, vol. iii., p. 200, pl. x., figs. 1–8.

The *Lysianassa Costæ* ♀ and *L. longicornis* ♂ of Dredging Report of 1863 and 1864 are referable to this more recently described form, which is distinguished from *L. plumosa* in wanting the upturned process of the lower hind margin of the third segment of the metasome. *L. ceratina* was taken off Holy Island, Northumberland (A. M. N.) N.

Acidostoma obesum (Bate)=*Anonyx obesus* Bate.

A number of specimens dredged in 39–59 fathoms off Durham and Northumberland coasts (A. M. N.) N.D.

Scopelocheirus Hopei (A. Costa)=*Callisoma crenata* B. & W.

Seven miles E. by S. from Tynemouth, 25 fathoms; near Holy Island and off other parts of Northumberland coasts (A. M. N.); off Seaham Harbour, 30–40 fathoms, abundant (G. H. and A. M. N.); off Berwick, 25 fathoms (A. Mk.) N.D.

Hippomedon denticulatus (Bate).

Seven miles E. by S. from Tynemouth, 25 fathoms; near Holy Island and several other places in deep water off Northumberland coast (A. M. N.); twelve fathoms off Newbiggin (G. S. B.); off Seaham Harbour (G. H.) N.D.

Hippomedon propinquus G. O. Sars.

Mr. Meek has taken a few specimens in 39 fathoms off Northumberland and Durham. N.D.

ORCHOMENE HUMILIS (A. Costa)

This is *Anonyx Edwardsii* Bate and Westwood (not Kröyer), *Anonyx melanophthalmus* Norman, *Anonyx serratus* Stebbing (not Boeck), and *Orchomene Batei* G. O. Sars, whose illustrations should be consulted, as those of Bate and Westwood are worthless.

Forty to fifty miles off Tynemouth, 40 fathoms, and 100 miles off in 25–30 fathoms (A. M. N.) N.

ORCHOMENELLA NANA (Kröyer)=*Tryphosa ciliata* G. O. Sars.

Five to six miles off Souter Point in 39 fathoms (A. Mk.); off the Durham coast (A. M. N.) D.

TRYPHOSA NANOIDES (Lilljeborg).

Thirty-four miles east of Alnmouth in 39 fathoms (A. Mk.) N.

TRYPHOSA SARSI (Bonnier) = *Tryphosa nana* G. O. Sars (not Kröyer).

Cullercoats and Beadnell in 1900 (A. Mk.) N.

TRYPHOSA HŒRINGII (Boeck).

Cullercoats (A. Mk.) N.

TRYPHOSITES LONGIPES (Bate)=*Anonyx longipes* B. & W. ♀= *Anonyx ampulla* B. & W. (not Kröyer) ♂.

One hundred miles off Tynemouth, 25–30 fathoms, 1862; and off Berwick, 1864 (A. M. N.); trawlers, Sunderland (G. S. B.); off Souter Point in 39 fathoms, and off Tyne in 25 fathoms (A. Mk.) N.D.

TMETONYX CICADA (Fabricius)=*Anonyx Hœlbolli* B. & W. (not Kröyer).

Off Holy Island, 35–50 fathoms, 1864, and off Seaham Harbour (A. M. N.) N.D.

LEPIDEPECREUM CARINATUM Bate & Westwood.

1861. *Anonyx longicornis*, Bate and Westwood, Brit. Sessile-eyed Crust., vol. i., p. 91 ♂; and Bate, Cat. Amphip. Brit. Mus., 1862, p. 72, pl. xi., fig. 4.

1869. *Lepidepecreum carinatum*, Bate and Westwood, Brit. Sessile-eyed Crust., vol. ii., p. 509 ♀.

1890. *Lepidepecreum mirabile*, Meinert, Videnskab. Udbytte Kanonbaden "Hauchs" Togter, Crust. Malacos., p. 153, pl. i., figs. 7–12.

1891. *Lepidepecreum carinatum*, G. O. Sars, Crust. Norway, Amphip., p. 113, pl. xxxviii., fig. 2, pl. xxxix., fig. 1.

1893. *Anonyx longicornis*, Della Valle, Fauna und Flora des Golfes von Neapel, Gammarini, p. 814, pl. lx., figs. 47–49.

Della Valle erroneously synonymizes the *Lepidepecreum clypeatum* of Chevreux and *L. foraminiferum* of Stebbing with the present species.

Although the specific name *longicornis* is the earlier one, it is altogether misleading, as it applies only to the male; and no injury is done to the describers in using their later name *carinatum*.

L. carinatum has a known distribution from South Norway and Shetland to the Mediterranean, but it would seem to be always scarce when found.

Two specimens have been taken by G. S. B. in 25 fathoms, four miles off Tynemouth; and another by A. Mk. in 25 fathoms off St. Mary's Isle in 1903. N.

Fam. 4.—PONTOPOREIIDÆ

Bathyporeia Guilliamsonia (Bate 1856)=*B. pilosa* B. & W. (not Lindström)=*B. norvegica* G. O. Sars.

Whitburn (G. S. B.) D.

Bathyporeia pelagica (Bate).

East of Souter Point, 39 fathoms; and very common in sand from 6 down to 40 fathoms (A. Mk.); Seaton Carew, 4 fathoms (G. S. B.) N.D.

Haustorius arenarius (Slabber)=*Sulcator arenarius* B. & W.

Sands between Whitburn and Sunderland (A. M. N.); coast of Northumberland (Albany Hancock *fide* Bate); Bamburgh and Whitburn (G. S. B.) N.D.

UROTHOE MARINA (Bate).

Near Holy Island, Northumberland, 35–50 fathoms (A. M. N.); off Seaham, 22 fathoms (G. S. B.) N.D.

UROTHOE ELEGANS Bate.

Towing net off the Tees, 1866 (G. S. B.) D.

FAM. 5.—PHOXOCEPHALIDÆ

METAPHOXUS FULTONI (Th. Scott).

Off the Tyne, 25 fathoms, 1904 (A. Mk.)

HARPINIA NEGLECTA G. O. Sars=*Phoxus plumosus* B. & W. (not of Kröyer).

In many dredgings off Northumberland and Durham in 39–59 fathoms (A. Mk.); seven miles off Tynemouth, 25 fathoms. frequent, and 100 miles off in 40–50 fathoms (A. M. N.) N.D.

HARPINIA SERRATA G. O. Sars.

Off Blyth in 22 fathoms (A. Mk.)

FAM. 6.—AMPELISCIDÆ

AMPELISCA TYPICA (Bate)=*Ampelisca Gaimardi* B. & W. (not Kröyer).

Off Holy Island and off Seaham, 25 fathoms (A. M. N.); off Ryhope, 10–12 fathoms (G. H.) N.D.

AMPELISCA TENUICORNIS Lilljeborg=*A. lævigata* B. & W. (not Lilljeborg).

Off Seaham (A. M. N.); in many dredgings off Northumberland and Durham (A. Mk.) N.D.

AMPELISCA ASSIMILIS (Boeck).

Off Marsden, 10 fathoms (A. M. N.); 25 miles E. of Alnmouth, 50 fathoms (A. Mk.); off Souter Point, 1904 (G. S. B.) N.D.

AMPELISCA BREVICORNIS (A. Costa)=*A. Belliana* B. & W.= *A. lævigata* (Lilljeborg) G. O. Sars.

In haddocks' stomachs, Hartlepool, off Seaham, near Holy Island, 40–50 fathoms (A. M. N.); off Whitburn (G. S. B.); not uncommon in moderate depths (A. Mk.) N.D.

AMPELISCA SPINIPES Boeck.

Northumberland coast, 1864; off Seaham (A. M. N.); off Cullercoats, and down to 50 fathoms 25 miles E. of Alnmouth, also off Blyth in 22 fathoms (A. Mk.) N.D.

AMPELISCA MACROCEPHALA Lilljeborg.

In 39–50 fathoms off Northumberland (A. Mk.) N.

BYBLIS GAIMARDI (Kröyer).

This is not *Ampelisca Gaimardi* B. & W., for which see *Ampelisca typica.*

Off Seaham (A. M. N.); 29 miles E. of Alnmouth in 59 fathoms (A. Mk.) N.D.

HAPLOOPS TUBICOLA Lilljeborg.

Off Marsden, 7 miles E. of Tynemonth, 1862, off Berwick, 1863, near Holy Island, 1864 (A. M. N.); 25 miles E. of Alnmouth in 50 fathoms, and off Blyth in 22 fathoms (A. Mk.) N.D.

FAM. 7.—AMPHILOCHIDÆ

AMPHILOCHUS MANUDENS Bate=*A. Boeckii* Meinert and *A concinnus* and *Callimera acutidigitata* Stebbing.

Off Seaham, 25–30 fathoms (G. H.); east of Alnmouth and Souter Point, 39–50 fathoms, 1901, and off Blyth in 22 fathoms, 1904 (A. Mk.) N.D.

AMPHILOCHOIDES SERRATIPES (Norman).

1869. *Probolium serratipes*, Norman, Last Report Dredging Shetland Isles. Brit. Assoc. Report for 1868, p. 273.

1892. *Amphilochoides odontonyx*, G. O. Sars, Crust. Norway, Amphip., p. 221, pl. lxxv., fig. 2 (not *A. odontonyx* Boeck).

1895. *Amphilochoides Boeckii*, id. ibid., p. 690.

East of Alnmouth and Souter Point, 39–50 fathoms, and also off the Tyne in 22 fathoms (A. Mk.) N.D.

AMPHILOCHOIDES ODONTONYX (Boeck).

1870. *Amphilochus odontonyx*, Boeck, Crust. Amphip. Borealia et Arctica, p. 51.

1892. *Amphilochoides pusillus*, G. O. Sars, Crust. Norway, Amphip., p. 222, pl. lxxvi., fig. 1.

1895. *Amphilochoides odontonyx*, id. ibid, p. 690.

Two and a half miles off Souter Point, Durham, 21 fathoms (A. Mk.) D.

GITANA SARSII Boeck.

In 21 fathoms off Northumberland (A. Mk.) N.

GITANOPSIS INERMIS (G. O. Sars).

Off Cullercoats (G. S. B.) N.

FAM. 8.—STENOTHOIDÆ

STENOTHOE MARINA (Bate).

Cullercoats and off Durham coast (A. M. N.); Cullercoats (J. Alder); Seaham, 25–30 fathoms (G. H.) N.D.

STENOTHOE MONOCULOIDES (Montagu).

Cullercoats (J. Alder); Ryhope (A. M. N.); Sunderland and near mouth of the Coquet (G. S. B.); North Sunderland (A. Mk.) N.D.

METOPA ALDERI (Bate)=*Montagua norvegica* B. & W. (not Lilljeborg) ♂.

Cullercoats (J. Alder and A. M. N.); 40-50 miles E. by N. from Tynemouth, 40 fathoms (A. M. N.); Alnmouth Bay (A. Mk.) N.

METOPA RUBROVITTATA G. O. Sars.

Several specimens from Cambois Bay, 1901, and 16–17 miles off Souter Bank, 39 fathoms (A. Mk.) N.D.

METOPA PUSILLA G. O. Sars.

East of the Longstone in 40 fathoms, Sept. 2, 1902 (A. Mk.) N.

METOPA NORVEGICA (Lilljeborg).

1850. *Leucothoe norvegica*, Bidr. till Norra Russlands och Norrige fauna, &c. K. Vet.-Akad. Hand., vol. ii., p. 335, pl. xx., fig. 4.

1855. *Montagua pollexiana*, Bate, Brit. Assoc. Report, p. 57.

1900. *Metopa norvegica*, Norman, Ann. and Mag. Nat. Hist., ser. 7, vol. vi., p. 41.

In the paper last referred to reasons are given for adopting Lilljeborg's specific name.

Cullercoats (J. Alder and A. M. N.); near Holy Island, 35–50 fathoms, and 40–50 miles E. by N. from Tynemouth, 40 fathoms (A. M. N.); Seaham (G. H.); Dogger Bank, 1899 (G. S. B.); 25 fathoms off Berwick (A. Mk.) N.D.

METOPA PROPINQUA G. O. Sars.

Off Blyth in 22 fathoms, 1904 (A. Mk.) N.

METOPA ABSCISA Norman.

1869. *Montagua clypeata*, Bate and Westwood, vol. ii., p. 499 (not *Leucothoe clypeata*, Kröyer).

1900. *Metopa abscisa*, Norman, Ann. and Mag. Nat. Hist., ser. 7, vol. vi., p. 42, pl. iii., figs. 6–10.

Cullercoats (A. M. N.) N.

METOPELLA NASUTA (Boeck).

The genus *Metopella* was suggested by Sars in his work at p. 274.

Twenty-nine miles off Alnmouth in 50 fathoms, and 16 miles off Souter Point, Durham, in 39 fathoms (A. Mk.) N.D.

STHENOMETOPA PALMATA (G. O. Sars).

A genus *Metopina* was established by A. M. N. with this species as the type (Ann. and Mag. Nat. Hist., ser. 7, vol. vi., 1900, p. 45), but that name being already preoccupied, *Sthenometopa* was substituted (Notes on the Natural History of East Finmark, Ann. and Mag. Nat. Hist., ser. 7, vol. x., 1902, p. 481).

About five miles off Souter Point, Durham, 30 fathoms (A. Mk.) D.

STHENOMETOPA ROBUSTA (G. O. Sars).

1892. *Metopa robusta*, G. O. Sars, Crust. Norway, Amphip., p. 270, pl. xcvi., fig. 1.

1900. *Metopina robusta*, Norman, Ann. and Mag. Nat. Hist., ser. 7, vol. vi., p. 45.

1902. *Sthenometopa robusta*, Norman, Ann. and Mag. Nat. Hist., ser. 7, vol. x., p. 480.

Off Cullercoats, August 30, 1906 (A. Mk.) N.

Cressa dubia (Bate)=*Danaia dubia* B. & W.

Off Alnmouth, 39–50 fathoms, off Cullercoats, and off Blyth in 22 fathoms (A. Mk.) N.

Fam. 9.—Œdiceridæ

Monoculodes carinatus (Bate).

Monoculodes Stimpsoni B. & W. would seem to be the same species (see A. M. N.'s notes Ann. and Mag. Nat. Hist., ser. 6, vol. iii., 1889, p. 447, pl. xix., figs. 1–5).

Off Berwick, 1864 (A. M. N.); one young specimen from the Inner Farne Islands, 1898 (A. Mk.) N.

Perioculodes longimanus (Bate & Westwood)=*Monoculodes Grubei* Boeck=*Monoculodes æquimanus* Norman, MS., D. Robertson.

Off Marsden, 10 fathoms (A. M. N.); Druridge Bay and 5–6 miles off Souter Point, 30–50 fathoms (A. Mk.) N.D.

Pontocrates arenarius (Bate).

1889. *Pontocrates arenarius*, Hoek, Crustacea Neerlandica ii., p. 28, pl. ix., fig. 7.

1906. *Pontocrates arenarius*, Norman and Scott, Crustacea of Devon and Cornwall, p. 68, pl. vi., figs. 1–4.

Pontocrates arenarius has not as yet been found in Norway. The species which Sars figures under that name (Supplement, pl. vi., fig. 2, pl. vii., fig. 1) must bear the name *Pontocrates norvegicus* Boeck. As far as our observations go the latter species is more generally met with on our coasts than *P. arenarius*. Hoek, on the plate referred to, has given an excellent figure of the second gnathopod of *P. arenarius*, the carpus of which is rounded at its extended point, whereas in *P. norvegicus* it is hollowed like a little spoon (Sars, Supp., pl. vi., fig. 2); there is still greater difference in the first gnathopod, which in *arenarius* has a very oblique palm (as in *P. altamarinus*, see Sars, Supp., pl. vii., fig. 2), whereas

in *P. norvegicus* it is scarcely at all oblique (Sars, Supp., pl. vi., fig. 2). Figures of this and allied forms are given in the "Crustacea of Devon and Cornwall."

Whitburn in sand between tidemarks (John Hancock and G. S. B.); Howden (G. H. and A. M. N.) N.D.

PONTOCRATES ALTAMARINUS (Bate).

1906. *Pontocrates altamarinus*, Norman and Scott, Crust. Devon and Cornwall, p. 69, p. vii., figs. 1–4.

One hundred miles off Tynemouth in 25–30 fathoms (A. M. N.) N.

SYNCHELIDIUM HAPLOCHELES (Grube).

1906. *Synchelidium haplocheles*, Norman and Scott, Crust. Devon and Cornwall, p. 67, pl. vi., figs. 7–9.

A. M. N. in his paper "A Month on the Trondhjem Fiord" (Ann. and Mag. Nat. Hist., ser. 6, vol. xv., 1895, p. 486) gave reasons for regarding *Kröyera brevicarpa* B. & W. and *Synchelidium brevicarpum* Sars as synonyms of this species, and substituted the name *P. tenuimanum* Norman for the *Synchelidium haplocheles* of Sars.

Inner Farne Islands, Alnmouth, Druridge Bay, Blyth Bay, and Cullercoats (A. Mk.) N.

HALIMEDON PARVIMANUS (Bate and Westwood).

This is *Westwoodia cœcula* and *W. hyalina* Bate, *Œdiceros parvimanus* B. & W., and *Halimedon Muelleri* Boeck (see Norman, Notes on British Amphipods, Ann. and Mag. Nat. Hist., ser. 6, vol. iii., p. 455, pl. xx., figs. 10–14).

Near Holy Island, 40–100 miles E. of Tynemouth in several dredgings, 7 miles off Seaham, 25 fathoms (A. M. N.); in dredgings in 21–39 fathoms off Souter Point (A. Mk.) N.D.

FAM. 10.—PLEUSTIDÆ

NEOPLEUSTES BICUSPIS (Kröyer).

This is not *Pherusa bicuspis* B. & W., but the species which was recorded in 1865 (Nat. Hist. Trans. Northumberland, Durham, and Newcastle, vol. i., p. 24) under the MS. name which Spence Bate had given to the specimens sent to him

"*Calliope bidentata*." It seems to be a common form along the east coast of Great Britain.

Forty to a hundred miles E. of Tynemouth, 25–40 fathoms, 1862 (A. M. N.), fishing boats, Cullercoats (J. Wright); trawlers, Sunderland (G. S. B.); off Seaham, 25–30 fathoms (G. H.); 45 fathoms 52 miles E.N.E. off Tyne, off Souter Point, and off Blyth, 22 fathoms (A. Mk.) N.D.

Sympleustes latipes (M. Sars) = *Calliope Ossiani* and *Fingalli* Bate.

Cullercoats (J. Alder and A. M. N.); trawlers, Sunderland (G. S. B.); 40 fathoms off Seaham (G. H.); 16–17 miles off Souter Point, 30 fathoms (A. Mk.) N.D.

Fam. 11.—EPIMERIIDÆ

Epimeria cornigera (Fabricius) = *Acanthonotus Owenii* B. & W.

Near Holy Island 35–50 fathoms, 3–50 miles off Tynemouth, and off Durham coast (A. M. N.); 25 miles off Alnmouth 50 fathoms and Berwick Bank 27 fathoms (A. Mk.) N.D.

Fam. 12.—IPHIMEDIIDÆ

Iphimedia obesa H. Rathke.

Cullercoats, fishing boats (J. Alder and A. M. N.); off Northumberland and Dogger Bank, and off Durham coast, 1862 (A. M. N.); Sunderland, trawlers (G. S. B.); off Alnmouth and off Souter Point (A. Mk.) N.D.

Odius carinatus (Bate)=*Otus carinatus* Bate.

A specimen taken on gravelly ground in 46 fathoms 10 miles off Berwick Bay, 1863 (A. M. N.) N.

Fam. 13.—TIRONIDÆ

Tiron acanthurus Lilljeborg.

This is *Syrrhoe bicuspis* Goës and *Tessarops hastata* Norman (Crustacea Amphipoda New to Science or to Britain, Ann. and Mag. Nat. Hist., ser. 4, vol. ii., 1868, p. 412, pl. xxii., figs. 4–7).

Off Durham coast, 1862 (A. M. N.); about five miles off Souter Point, 30 fathoms (A. Mk.) D.

ARGISSA HAMATIPES (Norman).

1869. *Syrrhoe hamatipes*, Norman, Last Report Dredging among the Shetland Isles. Brit. Assoc. Rep. for 1868, p. 279.

1870. *Argissa typica*, Boeck, Crust. Amphip. Borealia et Arctica, p. 45.

1890. *Chimæropsis danica*, Meinert, Videnskab. Udbytte Kanonbaden "Hauchs" Togter, Crust. Malacos., p. 167, pl. ii., figs. 42–47 ♂.

1891. *Argissa typica*, G. O. Sars, Crust. Norway, Amphip., p. 141, pl. xlviii.

In several dredgings off Northumberland and Durham in 39–59 fathoms (A. Mk.) N.D.

FAM. 14.—EUSIRIDÆ

EUSIRUS LONGIPES Boeck=*E. helvetiæ* Bate.

Deep water E. of Tynemouth, 1862, off Berwick, 1868, near Holy Island, 35–50 fathoms, 1864 (A. M. N.) N.

FAM. 15.—CALLIOPIIDÆ

APHERUSA BISPINOSA (Bate).

Cullercoats (J. Alder and A. M. N.); seven miles E. by S. from Tynemouth, 25 fathoms (A. M. N.); off Seaham, 25–40 fathoms (G. H.); low water, Sunderland, and 25 miles off Tynemouth (G. S. B.); off Blyth, 22 fathoms (A. Mk.) N.D.

APHERUSA BOREALIS (Boeck).

Tidemarks, Boulmer, and Cullercoats, Northumberland (G. S. B.) N.

APHERUSA CLEVEI G. O. Sars.

1904. *Apherusa Clevei*, G. O. Sars, "On a new planktozic species of the genus Apherusa (Conseil permanent international pour l'exploration de la Mer. Publications de circonstance, No. 10)."

In 22 fathoms off Blyth (A. Mk.) N.

Apherusa Jurinii (H. Milne-Edwards).

This is *Amphithoe norvegica* Rathke and *Pherusa fucicola* Bate *partly* (see Walker, Ann. and Mag. Nat. Hist., May, 1891, p. 418).

Cullercoats (J. Alder); 5–6 miles off Souter Point, 30 fathoms (A. Mk.); four miles off Tynemouth in 27 fathoms (G. S. B.) N.D.

Calliopius Rathkei (Zaddach).

Common between tidemarks. N.D.

Calliopius læviusculus (Kröyer).

Occasionally taken between tidemarks. We cannot regard the last as distinct from the present species (A. M. N.) N.D.

Fam. 16.—ATYLIDÆ

Nototropis Swammerdamii (H. Milne-Edwards).

Abundant between tidemarks. N.D.

Nototropis falcatus (Metzger).

Alnmouth, 1899 (G. S. B.); not uncommon on the sand outside of the rocks at Cullercoats and Druridge Bay (A. Mk.)

Mr. Meek makes the following interesting statement, "The modified first pair of peræopoda are used to grasp fragments of shell. Most frequently two pieces of shell are taken and grasped by the modified appendages. The animal has then the appearance of lying in a bivalve shell—the fragments of shell coming pretty close together dorsally. The active movements of the apparent bivalves betray, however, their crustacean occupant to the observer." N.

Nototropis vedlomensis (Bate).

Near Holy Island, 35–50 fathoms; 40–50 miles E. by N. from Tynemouth, 40 fathoms (A. M. N.). Two miles off Cullercoats (A. Mk.); off Souter Point, 1904 (G. S. B.) N.D.

Fam. 17.—DEXAMINIDÆ

Dexamine spinosa (Montagu).

This species seems to be rare on the east coast, while it is common on all the other shores of Great Britain.

Cullercoats and Druridge Bay (A. Mk.) N.

DEXAMINE THEA Boeck=*D. tenuicornis* Bate (not Rathke).

Among weeds at low water, Sunderland (G. S. B.) D.

TRITÆTA GIBBOSA (Bate)=*Atylus gibbosus* Bate.

Parasitic in sponges, Cullercoats, Oct. 5, 1864 (A. M. N.) N.

GUERNEA COALITA (Norman).

1868. *Helleria coalita*, Norman, Crustacea Amphipoda New to Science or to Britain. Ann. and Mag. Nat. Hist., ser. 4, vol. ii., p. 418, pl. xxii., fig. 8, and pl. xxiii., figs. 1–6.

1887. *Guernea coalita*, Chevreux, Crustacés Amphipodes de la côte ouest de Bretagne, p. 15, woodcuts 1, 2 (separate copy).

1887. *Guernea lævis*, Chevreux, ibid, p. 41.

1887. *Prianassus Nordenskioldii*, H. J. Hansen, Oversigt over det vestlige Grönlands Fauna af malakostrake Havskrebsdyr. Vidensk. Middel. fra den Naturh. Foren. i Kjöbenhavn, p. 82, pl. ii., figs. 7–7 e, and pl. iii., figs. 1–1 c.

1893. *Guernea coalita*, Della Valle, Fauna und Flora des Golfes von Neapel, Gammarini, p. 570, pl. xxxi., figs. 20–33. pl. lviii., fig. 80.

Surface nine miles N.E. of the Longstone (A. Mk.); off Souter Point (G. S. B.). This species is now known to have a wide range from West Greenland (H. J. Hansen) and Franz Joseph Land (Stebbing) to Naples (Della Valle). N.D.

FAM. 18.—MELPHIDIPPIDÆ

MELPHIDIPPELLA MACRA (Norman).

1869. *Atylus macer*, Norman, Last Report Dredging Shetland. Brit. Assoc. Rep. for 1868, p. 280.

1870. *Melphidippa longipes*, A. Boeck, Crust. Amphip. Bor. et Arct., p. 139.

1876. *Melphidippa longipes*, Boeck, De Skand. og Arct. Amphip., p. 414. pl. xxiv., fig. 5.

1889. *Melphidippa macra*, Norman, "Notes on British Amphipoda." Ann. and Mag. Nat. Hist., ser. 6, vol. iv., p. 121, pl. x., fig. 14, and pl. xii., figs. 4–7.

1894. *Melphidippella macera*, G. O. Sars, Crust. Norway, Amphip., p. 488, pl. clxxi.

In several dredgings 2½ to 17 miles off Souter Point, 21–39 fathoms (A. Mk.) D.

Fam. 19.—GAMMARIDÆ

Amathilla homari (Fabricius)=*Amathilla Sabini* Bate=*Graia imbricata* Bate (the young).

Very common in rock pools and between tidemarks, as well as in shallow water. We cannot see specific difference between *A. angulosa* and the young of this species, of which *Graia imbricata* Bate is a still younger condition. N.D.

Gammarus marinus Leach.

Ryhope, tidemarks (A. M. N.); Sunderland (G. S. B.); common on the coast (A. Mk.) N.D.

Gammarus locusta (Linné).

Abundant between tidemarks and in lammarian zone. N.D.

Gammarus Duebeni Lilljeborg.

1889. *Gammarus locusta* var., C. Hoek, Crustacea Neerlandica ii., p. 50, pl. x., fig. 13.

1889. *Gammarus campylops*, Norman, Notes on British Amphipods. Ann. and Mag. Nat. Hist., ser. 6, vol. iv., p. 139, pl. xii., fig. 13.

We follow Sars here in using Lilljeborg's specific name, but we are by no means convinced that the species is not the *G. campylops* of Leach.

Brackish water, Bamburgh, and Hartlepool Slake (A. M. N.); common in the Coquet about a mile from the mouth of the river; in a drain flowing into the Blyth (A. Mk.) N.D.

Gammarus campylops (Leach) G. O. Sars.

One specimen from the river Blyth (A. Mk.) N.

GAMMARUS PULEX (De Geer).

In lakes and streams everywhere. N.D.

NIPHARGUS SUBTERRANEUS (Leach).

1863. *Niphargus aquilex*, Bate and Westwood, Brit. Amphip., vol. i., p. 315.

1900. *Niphargus subterraneus*, Chilton, The Subterranean Amphipoda of Great Britain. Jour. Linn. Soc., Zool., vol. xxviii., p. 147, pls. xvi., xvii., fig. 1.

It is also *Gammarus puteanus* Koch and *Niphargus stygius* Westwood.

The late Mr. R. Howse gave me a specimen of this species in 1893, which had come from a well in West Hartlepool (A. M. N.) D.

MELITA OBTUSATA (Montagu) = *Melita proxima* Bate = *Megamæra Alderi* Bate ♀.

Near the Dogger Bank, 1862; fishing boats, Cullercoats, 1864 (A. M. N.); 25 miles off Alnmouth, 59 fathoms, and 30 miles off the Farnes, 42 fathoms (A. Mk.) N.

MELITA DENTATA (Kröyer).

1889. *Metita dentata*, Norman, Notes on British Amphipoda. Ann. and Mag. Nat. Hist., ser. 6, vol. iv., p. 135, pl. xii., figs. 8–10.

Three specimens taken from fishing boat at Cullercoats (A. M. N.); 25 miles E. of Alnmouth, 50 fathoms (A. Mk.)

Bate and Westwood write respecting *Mæra grossimana*, "Dr. Johnston records it as not rare in Berwick Bay (Zool. Journ., iii., 180)." That southern species is not at all likely to be found on the north-east coast, and there can be little doubt that in this as in some other cases *Melita dentata* was mistaken for that species. N.

MELITA PALMATA (Montagu).

Eighty-two miles E. by N. from Tynemouth in 40–45 fathoms, October, 1901 (A. Mk.); in a small salt-water pond at Amble (G. S. B.). The first locality given is a very unusual one for this species. N.

MEGALUROPUS AGILIS Norman.

1889. *Megaluropus agilis*, Norman, Notes on British Amphipoda. Ann. and Mag. Nat. Hist., ser. 6, vol. iii. p. 446, pl. xviii., figs. 1–10, and vol. iv., p. 123, pl. x., figs. 15–17.

1889. *Megaluropus agilis*, Hoek, Crustacea Neerlandica ii. Tids. der Nederland. Dierk. Vereeniging 2de Reeks Dei II., p. 28, pl. vii., fig. 7, pl. viii., fig. 3, pl. ix., fig. 3.

1890. *Cheirocratus Drechselii*, Meinert, Vidensk. Udbytte Kanonbaden "Hauchs" Togter, Crustacea Malacostraca, p. 170, pl. ii., figs. 48–52.

A few specimens from Cullercoats, Blyth Bay, and Druridge Bay (A. Mk.) N.

MÆRA OTHONIS (H. Milne-Edwards)=*Megamæra othonis* ♀ and *Megamæra longimana* ♂ (B. and W.)

Frequent off the coasts. N.D.

CHEIROCRATUS ASSIMILIS (Lilljeborg).

1851. *Gammarus assimilis*, Lilljeborg, Ofvers. Kong. Vet.-Akad. Förhand., p. 23, and 1854, Kong. Vet.-Akad. Handl., p. 455.

1865. *Cheirocratus mantis*, Norman, Nat. Hist. Trans, Northumberland and Durham, vol. i., p. 13, pl. vii.. figs. 14, 15, and Bate and Westwood, vol. ii., p. 513.

1889. *Cheicocratus assimilis*, Norman, Ann. and Mag. Nat. Hist., ser. 6, vol. iv., p. 129, pl. x., fig. 13, pl. xi., fig. 11.

Dredged in 35–50 fathoms off Holy Island in 1864 (A. M. N.) N.

CHEIROCRATUS SUNDEVALLI (Rathke).

This is *Lilljeborgia shetlandica* Bate ♂, *Protomedeia Whitei* Bate ♀, *Lilljeborgia Normani* Stebbing, *Cheirocratus brevicornis* Hoek. For changes in the development with growth of the second gnathopod see Norman, Ann. and Mag. Nat. Hist., ser. 6, vol. iv., p. 130, pl. xi., figs. 9, 10, and pl. xii., figs. 1–3.

Off Holy Island, 1864 (A. M. N.); 2½ miles off Souter Point, 21 fathoms, and Cullercoats (A. Mk.) N.D.

Fam. 20.—AORIDÆ

Microdeutopus anomalus (Rathke).

I have the following notes; seven miles off Tynemouth, 25 fathoms, frequent; off Holy Island, 1864 (A. M. N.); Sunderland, low water (G. S. B.); but the only specimens now in my collection are those from off Holy Island, which prove to be females of *Protomedeia fasciata* (which see). This throws some doubt on the other records. Females of the Aoridæ are often, especially young, difficult to distinguish; but the species last named is not likely to have occurred at low water. Mr. Meek in his list gives "*Microdeutopus* sp., a female was obtained at Cambois Bay in August, 1901."

Aora typica Kröyer=*A. gracilis* Bate.

Holy Island Harbour, 1900, and from 2½ miles off Souter Point in 21 fathoms (A. Mk.) N.D.

Lembos longipes (Lilljeborg).

A few specimens, Cullercoats, 28th August, 1901 (A. Mk.) N.

Lembos Websteri Bate.

1876. *Microdeuteropus bidentatus*, Stebbing, Ann. and Mag. Nat. Hist., ser. iv., vol. xvii., p. 73, pls. iv. and v., figs. 1, 1a, 1b ♂.

Twenty-four miles off Alnmouth, 50 fathoms, and 2½ miles off Souter Point in 21 fathoms (A. Mk.) N.D.

Fam. 21.—PHOTIDÆ

Protomedeia fasciata Kröyer.

Off Alnmouth, 39–50 fathoms, and 16 miles off Souter Point, 39 fathoms (A. Mk.). These specimens found by Mr. Meek were very young; on re-examining three specimens which were recorded in 1865 as "*Microdeutopus anomalus*" from off Holy Island, 38–50 fathoms, I find them to be full grown females of *Protomedeia fasciata*. A character which was the first to catch my eye, and is a very distinctive one, was the very slender propodos of the anterior pairs of peræopoda, and the slenderness and great length of the nail, which is quite as

long or longer than the propodos; this last little feature is not noticed or correctly figured by Sars—absolutely correct in minute details as he usually is—who represents the nail too short. I mention this because in a mixed gathering of females of *Microdeutopus*, *Aora*, *Protomedeia*, &c., this propodos and nail, being so easily seen, would enable the specimens of the latter to be at once singled out. N.D.

GAMMAROPSIS ERYTHROPHTHALMUS Lilljeborg = *Eurystheus tridentatus* Bate ♂=*Eurystheus bispinimanus* Bate ♀.

Off Holy Island and other parts of the Northumberland coast; fishing boats, Cullercoats (A. M. N.); Seaham, 25–30 fathoms (G. H.); trawlers, Sunderland (G. S. B.); E. of Alnmouth and off Souter Point (A. Mk.). This is perhaps *Gammarus maculatus* of Johnston. N.D.

GAMMAROPSIS PALMATA (Stebbing and Robertson).

1891. *Podoceropsis palmata*, Stebbing and Robertson, Four New British Amphipoda. Trans. Zool. Soc., vol. xiii., p. 36, pl. vi. A.

1894. *Gammaropsis nana*, G. O. Sars, Crustacea Norway, Amphipoda, p. 561, pl. cxcix., fig. 2.

Thirty-two miles E. of Alnmouth, 39 fathoms, and 2½–39 miles E. of Souter Point, Co. Durham, 21–39 fathoms (A. Mk.) N.D.

MEGAMPHOPUS CORNUTUS Norman.

1878. *Podoceropsis intermedia*, Stebbing, "Two new species of Amphipodous Crustacea." Ann. and Mag. Nat. Hist., ser. 5, vol. ii., p. 367, pl. xv., fig. 3.

Two and a half miles off Souter Point in 21 fathoms (A Mk.); and in the same neighbourhood by G. S. B. D.

PHOTIS LONGICAUDATA (Bate).

Off Blyth in 22 fathoms (A. Mk.) N.

PHOTIS REINHARDI Kröyer.

Off Alnmouth, Farne Islands, and off Souter Point, Co. Durham, in 21–59 fathoms, and off the Tyne in 22 fathoms

(A. Mk.); off Holy Island, 38–50 fathoms; 7–50 miles off Tynemouth, 25–40 fathoms (A. M. N.); Seaham, 20–30 fathoms (G. H.)

My Northumberland specimens were examined by Mr. Spence Bate and named *Eiscladus longicaudatus*; but on examination I find them to be referable to *Photis Reinhardi.* N.D.

Podoceropsis excavata (Bate)=*Nœnia excavata* Bate ♂, and *Nœnia rimapalmata* Bate ♀.

It is *Xenoclea Batei* Boeck and *Podoceropsis Batei* Meinert.

Northumberland coast (J. Alder); outside Holy Island, 35–50 fathoms; fishing boats, Cullercoats; off Sunderland, 1863 (A. M. N.); Seaham (G. H.); trawlers, Sunderland (G. S. B.); off Berwick in 25 fathoms, and off Blyth in 22 fathoms (A. Mk.) N.D.

Podoceropsis Sophiæ Boeck.

Both sexes of the last species, and the only specimen known to Bate of *Nœnia undata* were sent to him from Northumberland by Mr. Alder. *Nœnia undata* is believed to be the female of *Podoceropsis Sophiæ* Boeck (=*Nœnia tuberculosa* Bate); and if that species should hereafter be found off the Northumberland coast, which there is little doubt it will be, this suspicion would be confirmed. N.

Fam. 22.—AMPHITHOIDÆ

Amphithoe rubricata (Montagu)=*A. littorina* Bate.

Very common between tidemarks. N.D.

Fam. 23.—JASSIDÆ

Ischyrocerus anguipes Kröyer.

"Two or three females obtained at Cullercoats in August have four spines on the inner ramus of the third uropod, and a dorsal row of three or four spines on the telson, and therefore appear to belong to this species." Also in 42–45 fathoms 82 miles E.N. of the Tyne, and in 42 fathoms off the Farne Islands (A. Mk.) N.

ISCHYROCERUS MINUTUS Lilljeborg.

1889. *Podocerus isopus*, Walker, Proc. Biolog. Soc. Liverpool, vol. iii., p. 209, pl. xi., figs. 11–13, and 1890, vol. iv., p. 250, pl. xvi., fig. 7.

"Fairly common in the harbour at Cullercoats and at other places on the coast" (A. Mk.); Sunderland (G. S. B.) We regard this as a small form of the foregoing species. N.D.

BRUZELIELLA FALCATA (Montagu)=*Podocerus falcatus* B. & W.

Off Berwick, 1863; Cullercoats; off Seaham, 25–30 fathoms; off Sunderland (A. M. N.); Craster and 82 miles E. by N. from the Tyne in 42–45 fathoms (A. Mk.). See Norman and Scott, "Crustacea of Devon and Cornwall," p. 94, for remarks on generic name *Bruzeliella*. N.D.

BRUZELIELLA PUSILLA (G. O. Sars)=*Podocerus minutus* and *pusillus* G. O. Sars.

Eighty-two miles E. by N. from Cullercoats, 40–45 fathoms (A. Mk.). *Podocerus Herdmani* Walker and *Podocerus odontonyx* of G. O. Sars appear to be founded on a mere varietal or abnormal state of the second gnathopods in which a tubercle is produced in the middle of the inner face of the finger; indeed the typical specimen of *Bruzeliella falcata* as figured by Montagu has a similar form of the nail. N.

JASSA PELAGICA Leach.

This is *Jassa capillata* Bruzelius, *Podocerus capillatus* B. & W., *Janassa capillata* Sars, and *Parajassa pelagica* of Stebbing.

Berwick (A. M. N.) N.

FAM. 24.—COROPHIIDÆ

ERICHTHONIUS HUNTERI (Bate).

Off Durham coast (G. S. B.); off Souter Point, 21 fathoms; off Farnes in 42 fathoms; off Cullercoats in 20–25 fathoms; and 82 miles E. by N. from Tynemouth, 42–45 fathoms (A. Mk.) The females in this genus so closely resemble each other, that it is by no means easy to distinguish them if not found in company with males. N.D.

ERICHTHONIUS ABDITUS (Templeton).

One or two specimens from off Cullercoats (A. Mk.); off Holy Island (A. M. N.) N.

ERICHTHONIUS DIFFORMIS (H. Milne-Edwards).

Cullercoats (J. Alder and H. T. Mennell). N.

CERAPUS CRASSICORNIS Bate.

"Dredged by Mr. Joshua Alder on the Northumberland coast" (Spence Bate). These were the type specimens.

Off Cullercoats in 20 fathoms, and 82 miles E.N.E. from the Tyne in 42–45 fathoms (A. Mk.) N.

SIPHONŒCETES WHITEI (Gosse)=*Siphonœcetes Colletti* Boeck and *S. mucronatus* Metzger.

Pretty common on the sand near to the rocks at the south end of Druridge Bay (A. Mk.). Mr. Meek has made some interesting observations on this species (Northumberland Sea Fisheries Commission Report, Scientific Investigations, 1901, p. 59). He has also found it in Skate Roads, North Sunderland, and at Cullercoats in 25 fathoms. N.

COROPHIUM VOLUTATOR (Pallas)=*Cancer grossipes* Linné=*Corophium longicorne* B. & W.

Common in mud near mouths of rivers and in salt marshes. N.D.

COROPHIUM CRASSICORNE Bruzelius.

Cullercoats, January 23, 1909 (A. Mk.); Roker (G. S. B.) N.D.

COROPHIUM BONELLI H. Milne-Edwards.

One specimen off Cullercoats, 5th August, 1900 (A. Mk.) N.

UNCIOLA PLANIPES Norman.

1865. *Unciola planipes*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 14, pl. vii., figs. 9–13.

1868. *Unciola leucopis*, Bate and Westwood, vol. ii., p. 518 (not *Unciola leucopis*, Kröyer).

1870. *Glauconome Kroyeri*, Boeck, Crustacea Borealia et Arctica. Vidensk.-Selsk. Forhand., p. 179 ♂.

1870. *Glauconome Steenstrupi*, idem. ibidem., p. 150 ♀.

The type specimen was taken off Holy Island in 35–50 fathoms in July, 1864 (A. M. N.) N.

Unciola crenatipalmata (Bate).

1863. *Dryope crenatipalmata*, B. & W., vol. i., p. 490 ♂.

1863. *Dryope irrorata*, B. & W., vol. i., p. 488 ♀.

1889. *Unciola crenatipalmata*, J. Bonnier, Les Amphipodes du Boulonnais. Bull. Soc. Sci. de France et Belgique, p. 229, pls. xii., xiii.

Near the rocks at Cullercoats, August, 1899 (A. Mk.) N.

Fam. 25.—DULICHIIDÆ

Dulichia porrecta Bate.

Twenty-nine miles E. of Alnmouth, 59 fathoms; off Souter Point, 39 fathoms (A. Mk.); off Souter Point (G. S. B.) N.D.

Dulichia falcata Bate.

Fishing boats, Cullercoats (J. Alder). N.

Dulichia monacantha Metzger.

One specimen 25 miles off Durham in 45 fathoms, muddy sand (G. S. B., *fide* A. Mk.) D.

Section III.—CAPRELLIDEA

Fam. 1.—CAPRELLIDÆ

Phtisica marina Slabber=*Proto pedata* ♀=*P. Goodseri* ♂.

Several specimens from three miles off Cullercoats (A. Mk.). From Hydrozoa, deep water, off Cullercoats, and Durham coast (A. M. N.); trawlers, Sunderland (G. S. B.) N.D.

Pseudoprotella phasma (Montagu)=*Protella phasma* Bate.

Three miles E. of Tynemouth and off Seaham (A. M. N.); Cullercoats from fishing boats (J. Alder); 28 fathoms off Cullercoats (A. Mk.) N.D.

Caprella linearis (Linné).

The commonest Caprellidan in the district. *Caprella lobata* B. & W. is the adult male of this species. Some specimens sent to Mr. Spence Bate from Cullercoats and Seaham were recorded by B. & W., vol. ii., p. 73, as *C. equilibra*; they

however are not that species, but the male of the present one. N.D.

PERIAMBUS TYPICUS (Kröyer)=*Caprella typica* B. & W.

Off Alnmouth, 39 fathoms, off Cullercoats in 20–25 fathoms, and off Souter Point, Co. Durham, in 21–39 fathoms (A. Mk.); 30 miles off Sunderland, 40 fathoms (G. S. B.) N.D.

SUB-CLASS III.—ENTOMOSTRACA

ORDER VII.—BRANCHIOPODA

SUB-ORDER I.—PHYLLOCARIDA

FAM. 1.—NEBALIIDÆ

NEBALIA BIPES Fabr.

Not common, but occasionally taken off the coast. N.D.

SUB-ORDER II.—CLADOCERA

The works and papers chiefly to be consulted with relation to the Cladocera are :—

1. Baird (W.). Natural History of British Entomostraca, 1850.
2. Norman (A. M.) and Brady (G. S.). Monograph British Entomostraca of Families Bosminidæ, Macrothricidæ, and Lynceidæ. Nat. Hist. Trans. Northumberland and Durham, vol. i., 1867, pp. 354–408, pls. xviii.–xxiii.
3. Brady (G. S.). British species of Entomostraca belonging to Daphnia and other allied genera. Trans. Nat. Hist. Soc. Northumberland and Durham, vol. xiii., 1898, pp. 217–248, pls. vii.–x.
4. Lilljeborg (W.). Cladocera Sueciæ (König. Gesellsch. Wissensch., Upsala), 1901.

The last work is indispensable to the student of the Cladocera. All the following species will be found described and amply figured in it. References need not be given in general to Lilljeborg, but they will be given to the best figures of the species in papers by British authors.

Division 1.—CALYPTOMERA

Section I.—CTENOPODA G. O. Sars

Fam. 1.—SIDIDÆ

Sida crystallina (O. F. Müller).

1850. *Sida crystallina*, Baird, Brit. Entom., p. 107, pl. xii., figs. 3, 4, pl. xiii., fig. 1 a–h.

1901. *Sida crystallina*, Lilljeborg, l.c., p. 18, pl. i., figs. 1–10, pl. ii., figs. 1–3.

Apparently in all the larger pieces of water; Crag, Broomley, Grindon, Greenley, West Rothley, and South Belsay Lakes, Northumberland; Wynyard, Hardwick, and Sedgefield (A. M. N.); Sweethope (G. S. B.) N.D.

Diaphanosoma brachyurum (Liévin).

1848. *Sida brachyura*, Liévin, Branchiopoden der Danziger Gegend, p. 20, pl. iv., figs. 3–9.

1850. *Diaphanosoma Brandtianum*, S. Fischer, Ergänzungen. . . Umgegend von St. Petersburg vorkom. Crust. Ord. Branchiopoden und Entomostraceen. Mem. des Sav. Etrang., vol. vii., p. 10, pl. iii., figs. 1–5.

1865. *Daphnella Brandtiana*, G. O. Sars, Norges Fersk-vandskrebsdyr; Branchiopoda I. Cladocera Ctenopoda, p. 45, pl. ii., figs. 25–33.

1901. *Diaphanosoma brachyurum*, Lilljeborg, l.c., p. 36, pl. iii., figs. 6–13, pl. iv., figs. 1–4.

1907. *Diaphanosoma brachyura*, var. *nasuta*, Kane (W. F. de V.), The Irish Naturalist, vol. xvi., p. 305, pl. xli.

Other synonyms are *Sida brachyura* Lilljeborg "De Crustaceis," *Daphnella brachyura* of P. E. Müller, Hudendorff, and Herrick, *Sida Brandtiana* Leydig, *Daphnella brachyura* Hellich, and *Diaphanosoma Brandtianun* G. O. Sars.

Daphnella Baird, 1850, is preoccupied; *Diaphanosoma* S. Fischer published later in the same year must therefore be the name of this genus.

The second species of this genus—if the former is worthy of specific rank—is *Diaphanosoma Wingii* Baird. Of this the following are, according to Lilljeborg, synonyms : *Sidæa crystallina* S. Fischer, 1851 ; *Diaphanosoma Leuchtenbergianum* S. Fischer, 1854 ; *Daphnella brachyura* G. O. Sars, 1865, Hellich, Daday, and Stengelin ; *Daphnella Brandtiana* P. E. Müller, Herrick, and Matile ; *Diaphanosoma brachyurum* G. O. Sars, 1890 ; and *Diaphanosoma Leuchtenbergianum* Lilljeborg, 1901.

The antennæ when directed backwards do not reach the end of the body in *D. brachyurum* ; in *D. Leuchtenbergianum* they attain the length of the body or reach beyond it.

We have taken *Diaphanosomæ* in Darden Lakes, Northumberland ; and in Wynyard and Hardwick Sedgefield lakes, Co. Durham ; but as they were taken some forty years ago we are unable to say positively to which species they belonged ; such specimens as have been preserved appear to be referable to *D. brachyurum* (A. M. N.) N.D.

Section II.—ANOMOPODA

Fam. 1.—DAPHNIIDÆ

Dactylura magna (Strauss).

1898. *Dactylura magna*, G. S. Brady, l.c., p. 241, pl. x., figs. 1–8, 18.

Pond at Layton Farm, near Sedgefield, Co. Durham (A. M. N.) ; pond at Elstobb House and at Canal Farm, High Barnes, near Sunderland (G. S. B.) ; quarry pond between Plessey and Blagdon, Northumberland (G. S. B. and A. M. N.) N.D.

Daphnia pulex (De Geer).

Common in ditches and small ponds. N.D.

Daphnia obtusa Kurz.

1898. *Daphnia obtusa*, G. S. Brady, l.c., p. 224, pl. ix., figs. 5–9.

Pond at Bishopton, Co. Durham (A. M. N.) D.

VAR. PROPINQUA G. O. Sars.

1898. *Daphnia obtusa*, var. *propinqua*, G. S. Brady, l.c., p. 225, fig. A, and pl. viii., figs. 21, 22.

Pond at Morton House near Fence Houses (A. M. N.) D.

DAPHNIA HAMATA G. S. Brady.

1898. *Daphnia hamata*, G. S. Brady, l.c., p. 227, pl. vii., figs. 9–17.

Ponds at Wallington, Northumberland, and near the Bowes House Lodge of Lambton Castle (A. M. N.) N.D.

DAPHNIA LONGISPINA O. F. Müller.

1898. *Daphnia longispina*, G. S. Brady, l.c., p. 228, pl. viii., figs. 11–19.

Crag, Paston, and Sweethope Lakes, Northumberland (G. S. B.); lakes at Wynyard and Hardwick Sedgefield, and moat at Raby Castle. I am not sure if the two badly mounted specimens which I have of the species from Crag Lake may not rather be referable to *D. lacustris* G. O. Sars (A. M. N.) N.D.

SCAPHOLEBERIS MUCRONATA (O. F. Müller).

In Greenley and Chartners lakes; and in the river Till at Etal, Northumberland; in the lakes at Wynyard and Hardwick Sedgefield (A. M. N.); the Loughs, Knaresdale (G. S. B.) N.D.

SIMOSA VETULA (O. F. Müller).

The generic name *Simocephalus* being preoccupied for a genus of snakes, A. M. Norman has substituted for the later *Simocephalus* of Schoedler the name *Simosa* (see Ann. and Mag. Nat. Hist, ser. 7, vol. xi., 1903, p. 367).

This is a common species in lakes, ponds, and streams. N.D.

CERIODAPHNIA RETICULATA (Jurine).

1901. *Ceriodaphnia reticulata*, Lilljeborg, l.c., p. 184, pl. xxvii., figs. 1–10.

Newbiggin, Northumberland; Sedgefield, Co. Durham (A. M. N.) N.D.

CERIODAPHNIA MEGALOPS G. O. Sars.

1901. *Ceriodaphnia megalops*, Lilljeborg, l.c., p. 190, pl. xxvii., figs. 11–15.

Abundant in the river Till at Etal, Northumberland (A. M. N.) N.

CERIODAPHNIA QUADRANGULA (O. F. Müller).

1901. *Ceriodaphnia quadrangula*, l.c., p. 193, pl. xxviii., figs. 1–5.

Chartners Lake, Northumberland (A. M. N.) N.

CERIODAPHNIA PULCHELLA G. O. Sars.

1901. *Ceriodaphnia pulchella*, Lilljeborg, l.c., p. 198, pl. xxviii., figs. 6–18.

Lake at Hardwick Hall, Sedgefield (A. M. N.); Tindale Tarn (G. S. B.) N.D.

CERIODAPHNIA LATICAUDATA P. E. Müller.

1901. *Ceriodaphnia laticaudata*, Lilljeborg, l.c., p. 208, pl. xxix., figs. 8–14.

Lake at Wynyard Park (A. M. N.) D.

FAM. 2.—BOSMINIDÆ

BOSMINA LONGIROSTRIS (O. F. Müller).

1867. *Bosmina longirostris*, Brady and Norman, l.c., p. 357, pl. xxii., fig. 4.

1901. *Bosmina longirostris*, Lilljeborg, l.c., p. 226, pl. xxx., figs. 13–16, pl. xxxi., figs. 1–18, pl. xxxii., figs. 1–3.

Bosminæ have been taken by me in Darden and Sweethope Lakes, Northumberland; also at Wynyard and Hardwick Hall, Sedgefield, and moat at Raby Castle; and I believe all of them to have been this species, but as it is more than forty years ago when they were found, and I merely have records and not specimens, it is possible that those from one or more of the Northumberland localities may belong to the following species (A. M. N.) N.D.

BOSMINA OBTUSIROSTRIS G. O. Sars.

1867. *Bosmina longispina*, Brady and Norman, l.c., p. 358, pl. xxii., figs. 1, 2.

1901. *Bosmina obtusirostris*, Lilljeborg, l.c., p. 237, pl. xxxii., figs. 4–13, pl. xxxiii., figs. 1–12, pl. xxxiv., figs. 1–12, pl. xxxv., figs. 1–9, pl. xxxvi., figs. 1–12, pl. xxxvii., figs. 1–7.

Tarns on the Humbles, Northumberland (G. S. B.) N.

Fam. 3.—MACROTHRICIDÆ

Ilyocryptus sordidus (Liévin).

1863. *Acantholeberis sordida*, Norman, Ann. and Mag. Nat. Hist., ser. 3, vol. ii., p. 4 (separate copy), pl. xi., figs. 6–9; and Tyneside Nat. Field Club, vol. vi., p. 55, pl. vi., figs. 6–9.

1867. *Ilyocryptus sordidus*, Norman and Brady, l.c., p. 368.

Eastern lake at Belsay, and ditch on the south side of the railway between Hexham and Corbridge (G. S. B.); pond of the deserted colliery at Bishop Middleham, and in the Forge Dam at Sedgefield (A. M. N.) N.D.

Macrothrix laticornis (Jurine).

1867. *Macrothrix laticornis*, Norman and Brady, l.c., p. 360, pl. xxiii., figs. 4, 5.

1901. *Macrothrix laticornis*, Lilljeborg, l.c., p. 338, pl. liv., figs. 6–13.

East lake at Belsay, Northumberland, at Fardingslake, and in the Glebe Engine Pond, Sunderland (G. S. B.). All these localities are now either built over or otherwise spoiled. N.D.

Macrothrix hirsuticornis Norman and Brady.

1867. *Macrothrix hirsuticornis*, Norman and Brady, l.c., p. 361, pl. xxiii., figs. 6, 7.

1901. *Macrothrix hirsuticornis*, Lilljeborg, l.c., p. 346, pl. lv., figs. 6–14.

The types of this species were taken by G. S. B. in 1864 in a slow-running stream at Ashburn, Sunderland. D.

Drepanothrix dentata (H. A. Eurén).

1867. *Drepanothrix hamata*, Brady and Norman, l.c., p. 264, pl. xxii., figs. 5–7.

1901. *Drepanothrix dentata*, Lilljeborg, l.c., p. 368, pl. lvii., figs. 2–16.

In two of the small lakes at Darden, Northumberland, in 1864, and again at a subsequent visit (A. M. N.) N.

ACANTHOLEBERIS CURVIROSTRIS (O. F. Müller).

1863. *Acantholeberis curvirostris*, Norman, "On Acantholeberis Lilljeborg." Ann. and Mag. Nat. Hist., ser. 3, vol. xi., p. 2 (separate copy), pl. xi., figs. 1–5, and Trans. Tyneside Nat. Field Club, vol. vi., p. 53, pl. vi,, figs. 1–5.

1901. *Acantholeberis curvirostris*, Lilljeborg, l.c., p. 375, pl. lvii., fig. 17, pl. lviii., figs. 1–17.

This is a species which affects peaty water, and seems never to occur in the valleys. Crag Lake, Northumberland (G. S. B.). In Chartners, Aird, and Darden lakes, and in bog-pools near Winter's Stob, Northumberland (A. M. N.) N.

FAM. 4.—CHYDORIDÆ

EURYCERCUS LAMELLATUS (O. F. Müller).

1867. *Lynceus lamellatus*, Norman and Brady, l.c., p. 401 pl. xx., fig. 8.

1901. *Eurycercus lamellatus*, Lilljeborg, l.c., p. 386, pl. lix., figs. 1–10, and pl. lx., figs. 1–10.

A common species in ponds, lakes, slow rivers, etc. N.D.

CAMPTOCERCUS RECTIROSTRIS Schödler.

1867. *Lynceus macrourus*, Norman and Brady, l.c. (nec Müller), p. 373, pl. xx., fig. 6, pl. xxi., fig. 2.

1901. *Camptocercus rectirostris*, Lilljeborg, l.c., p. 402, pl. lxi., fig. 14, pl. lxii., figs. 1–17.

Crag, Greenley, and Grindon lakes, Northumberland (A. M. N.) N.

ACROPERUS HARPÆ Baird.

1867. *Lynceus harpæ*, Norman and Brady. l.c., p. 372, pl. xxi., fig. 1.

1901. *Acroperus harpæ*, Lilljeborg, l.c., p. 418, pl. lxiii., figs. 14–24, pl. lxiv., figs. 1–10.

Common in the clear water of ponds and lakes. N.D.

Alonopsis elongata G. O. Sars.

1867. *Lynceus elongatus*, Norman and Brady, l.c., p. 374, pl. xviii., fig. 1, pl. xvi., fig. 2.

1901. *Alonopsis elongata*, Lilljeborg, l.c., p. 434, pl. lxv., figs. 5–20.

This is a lover of moorland lakes and tarns where there is some admixture of peat with the water. In Northumberland it is widely distributed in such situations, occurring in all the Northumberland lakes and many smaller pieces of water. N.

Alona quadrangularis (O. F. Müller).

1867. *Lynceus quadrangularis*, Norman and Brady, l.c., p. 377, pl. xxi., fig. 5.

1867. *Alona sanguinea*, P. E. Müller, Danmarks Cladocera, Naturhist. Tidsskrift, ser. 3, vol. v., p. 177.

1901. *Lynceus quadrangularis*, Lilljeborg, l.c., p. 448, pl. lxvi., figs. 8–17.

Common in lakes, ponds, and slow streams. N.D.

Alona affinis (Leydig).

1860. *Lynceus affinis*, Leydig, Naturgesch. d. Daphniden, p. 223, pl. ix., figs. 65–69.

1867. *Alona oblonga*, P. E. Müller, Danmarks Cladocera, Naturhist. Tidsskrift, ser. 3, vol. v., p. 175, pl. iii., figs. 22, 23, pl. iv., figs. 1, 2.

1901. *Lynceus affinis*, Lilljeborg, l.c., p. 455, pl. lxvi., figs. 18–21, pl. lxvii., figs. 1–17, pl. lxviii., fig. 1.

This is *Lynceus quadrangularis* S. Fischer and *Alona quadrangularis* of Herrick.

Forge Dam, Sedgefield (A. M. N.); East Belsay Lake (G. S. B.) N.D.

Alona tenuicaudis G. O. Sars.

1867. *Lynceus tenuicaudis*, Norman and Brady, l.c., p. 376, pl. xix., fig. 3.

1867. *Alona tenuicaudis*, P. E. Müller, Danmarks Cladocera, Naturhist. Tidssk., ser. 3, vol. v., p. 179, pl. ii., fig. 20, pl. iii., fig. 24.

1901. *Lynceus tenuicaudis*, Lilljeborg, l.c., p. 461, pl. lxviii., figs. 2–8.

In a small pond at Morden Moor Farm near Sedgefield (A. M. N.) D.

Alona costata G. O. Sars.

1867. *Lynceus costatus*, Norman and Brady, l.c., p. 379, pl. xviii., fig. 2, and pl. xxi., fig. 7.

1867. *Alona lineata* (Schödler), P. E. Müller, Danmarks Cladocera, Naturhist. Tidssk., ser. 3, vol. v., p. 178, pl. iv., figs. 3, 4.

1901. *Lynceus costatus*, Lilljeborg, l.c., p. 465, pl. lxviii., figs. 9–15.

Rothley, Aird, Capheaton, Chartners, Crag and Grindon Lakes, Northumberland; old colliery pond at Bishop Middleham; pond near Houghton-le-Spring, Co. Durham (A. M. N.); Wallington, Rothley, and Belsay Lakes, Northumberland (G. S. B.) N.D.

Alona guttata G. O. Sars.

1867. *Lynceus guttatus*, Norman and Brady, l.c., p. 380, pl. xviii., fig. 6, and pl. xxi., fig. 10.

1874. *Alona parvula*, Kurz, Dodekas neuer Cladoceren, &c. (separate copy), p. 44, pl. ii., fig. 8.

1874. *Alona tuberculata*, id. ibid., p. 45, pl. ii., fig. 3.

1901. *Lynceus guttatus*, Lilljeborg, l.c., p. 468, pl. lxviii., figs. 16–26.

Crag and Sweethope Lakes, Northumberland, and in a small pond at East Herrington, Co. Durham (A. M. N.); in ponds at Cullercoats and at Marsden, Co. Durham (G. S. B.) N.D.

Alona rostrata Köeh.

1867. *Lynceus rostratus*, Norman and Brady, l.c., p. 394, pl. xix., fig. 1, pl. xxi., fig. 6.

1901. *Lynceus rostratus*, Lilljeborg, l.c., p. 482, pl. lxix., figs. 7–21.

East Lake at Belsay, Northumberland (G. S. B.); river Till at Etal, Northumberland (A. M. N.) N.

Rhynchotalona falcata (G. O. Sars).

1862. *Harporhynchus falcatus*, G. O. Sars, Om de i Omengen af. Christiania forekommende Cladocerer, Forhand. Videns-Selsk. Christiania, 1861, p. 41 (separate copy).

1867. *Lynceus falcatus*, Norman and Brady, l.c., p. 387, pl. xviii., fig. 4, pl. xx., fig. 1.

1884. *Leptorhynchus falcatus*, C. L. Herrick, Final Report on the Crustacea of Minnesota, p. 114, pl. i., fig. 17.

1901. *Leptorhynchus falcatus*, Lilljeborg, l.c., p. 488, pl. lxix., figs. 22–26, pl. lxx., figs. 1–5.

1903. *Rhynchotalona falcata*, Norman, New generic names for some Entomostraca and Cirripedia. Ann. and Mag. Nat. Hist., ser. 7, vol. xi., p. 367.

Sars' generic name *Harporhynchus* being pre-occupied, Herrick substituted *Leptorhynchus*, an unfortunate choice, as the name had been more than once previously used, and therefore Dr. Norman has re-named the genus *Rhynchotalona*.

Greenley Lake, Northumberland (A. M. N.), and Sweethope (G. S. B.) N.

Leydigia Leydigii (Schödler).

1860. *Lynceus quadrangularis*, Leydig (nec Müller), Naturgesch. der Daphniden, p. 221, pl. viii., fig. 50.

1863. *Alona Leydigii*, Schödler, Neue Beiträge zur Naturgesch. d. Cladoceren, p. 27.

1874. *Leydigia quadrangularis*, Kurz, Dodekas neuer Cladoceren (separate copy), p. 52, pl. ii., fig. 2.

1901. *Leydigia quadrangularis*, Lilljeborg, l.c., p. 494, pl. lxx., figs. 6–17, pl. lxxi., figs. 1–3.

Schödler was undoubtedly right in re-naming this species, because the specific name *quadrangularis*, as used by Leydig, was that of another species described by Müller, and misapplied by Leydig to the present form.

The specimen assigned to *Lynceus acanthocercoides* by Brady and Norman (l.c., p. 385, pl. xix., fig. 5, pl. xxi., fig. 7), was really the present form, and not that described by Fischer.

The specific distinction between the two is certainly very slight, but apparently constant.

My discovery and re-discovery of this species I look upon as one of the most curious and remarkable experiences in my life as a naturalist. One afternoon, June 22nd, 1864, I brought home a gathering made in a pond at Lambton Park. Examination proved it in the main to consist of *Daphnia pulex*; but there floated across the field of the microscope the post-abdomen of a Lynceid which I at once recognised from its peculiar spination as something new to me; but it flashed across me that I had seen somewhere a figure like it. Taking down a MS. book from my library I found in it a tracing made at the Brit. Museum Library of Fischer's figure of *Lynceus acanthocercoides*. That this species described from Moscow should be here before me in that fragment of a post-abdomen was of course of the highest interest. The whole gathering was therefore passed drop by drop under review in the microscope, and the remainder of the slough or cast skin of the specimen to which the post-abdomen belonged was met with, but no other specimen; and Moscow was its only known home.

Twenty years passed by. I had three or four times brought home gatherings from the Lambton Pond, but the phantom *Leydigia* had not shown itself again either to myself or, as far as I am aware, to any other British naturalist. Some young friends were coming to me in the evening, and I required living material to show them under the microscope. At the breakfast table I told a nephew who was staying with me the foregoing story, and said we would in the afternoon go to the said pond to get what I required, and perhaps *Leydigia* might be found. I went into my library and began to examine a gathering I made ten days before at Seaton Carew, and there was *Leydigia*! I called up my nephew and remarked how curious it was that it should thus have turned up just after I had been talking about it. In the afternoon we went to the old habitat in Lambton Park, and there again was *Leydigia*. From two different localities in the same day!

I believe I can explain how it was that my search had before been unsuccessful. The species is a bottom-loving form. I had worked only in the water and among the weeds, while it lay snug below, but the light cast skin of 1864 had floated up and so been taken among the Daphniæ (A. M. N.)

Pond near the Bowes House Lodge of Lambton Park; ditches at Seaton Carew (A. M. N.); ditch south side of railway between Hexham and Corbridge, May, 1885 (G. S. B.)

Graptoleberis reticulata (Baird).

1867. *Lynceus testudinarius*, Norman and Brady, l.c., p. 381, pl. xviii., fig. 7, and pl. xxi., fig. 4.

1901. *Graptoleberis testudinaria*, Lilljeborg, l.c., p. 504, pl. lxxi., figs. 9–14, pl. lxxii., figs. 1–8.

It is *Alona esocirostris* of Schödler.

Crag, Grindon, Chartners, and Darden Lakes, Northumberland, and Hardwick Lake, Sedgefield (A. M. N.); Belsay Lake, Northumberland; Boldon Flats and Fardingslake, Co. Durham (G. S. B.) N.D.

Alonella excisa (S. Fischer).

1854. *Lynceus excisus*, S. Fischer, Abhand. neue oder nicht genau gekannte Arten Daphniden u. Lynceiden. Bull. Soc. Imp. Nat. de Moscou, p. 428, pl. iii., figs. 11–14.

1863. *Pleuroxus excisus*, Schödler, Neue Beiträge zur Naturgeschichte der Cladoceren, p. 49, pl. ii., fig. 38.

1888. *Pleuroxus excisus*, Hellich, Die Cladoceren Böhmens, p. 99, fig. 56.

1894. *Pleuroxus exiguus*, Wisenberg-Lund, Grönlands Ferskvandsentomostraca. Middel. naturhist. Foren. i Kjöbenhavn, p. 127, pl. iv., fig. 16 (separate copy).

1901. *Alonella excisa*, Lilljeborg, l.c., p. 510, pl. lxxii., figs. 9–19.

"Crag, Greenley, Broomley, Chartners, and Darden Lakes, and a pool in the moors at Winter's Stob" (A. M. N.). These

localities were given in our paper of 1867. Probably most of them, if not all, apply to the present species, with which *Alonella exigua* Lilljeborg was united by us. The differences between the two species according to Lilljeborg's recent work appear to be very slight. The illustrations given by us in 1867 are regarded by Lilljeborg as referable to *A. exigua*; but we do not now know in what locality the figured specimen was taken. N.

Alonella exigua (S. Fischer).

1853. *Lynceus exiguus*, Lilljeborg, De Crust. ex Ord. tribus, &c., p. 79, pl. vii., figs. 9, 10.

1874. *Alonella exigua*, Kurz, Dodekas neuer Cladoceren, p. 58, pl. iii., fig. 2.

1877. *Pleuroxus exiguus*, Hellich, Die Cladoceren Böhmens, p. 99, fig. 57.

1900. *Alonella exigua*, Lilljeborg, Cladocera Sueciæ, p. 513, pl. lxxii., figs. 20–26.

See under preceding species.

Alonella nana (Baird).

1850. *Acroperus nanus*, Baird, Brit. Entom., p. 130, pl. xvi., fig. 6.

1861. *Alona pygmæa*, G. O. Sars, Om de i omegnen af Christiania forekommende Cladocerer. Forh. Vid.-Selsk. Christiania, 1861, p. 20 (separate copy).

1863. *Pleuroxus transversus*, Schödler, Neue Beit. z. Naturgesch. d. Cladoceren, p. 50, pl. iii., figs. 52, 53.

1867. *Lynceus nanus*, Norman and Brady, l.c., p. 396, pl. xviii., fig. 8, pl. xxi., fig. 8.

1901. *Alonella nana*, Lilljeborg, l.c., p. 517, pl. lxxii., figs. 27–31.

Greenley, Sweethope, Darden, and Capheaton lakes; Winter's Stob; Aird, in Northumberland; Hardwick Lake, Sedgefield (A. M. N.); Wallington, Rothley, and Belsay; Fardingslake near Marsden (G. S. B.) N.D.

PERACANTHA TRUNCATA (O. F. Müller).

1903. *Peratacantha truncata*, Lilljeborg, l.c., p. 522, pl. lxxiii., figs. 1–20.

Lilljeborg has changed *Peracantha* into the more classical form *Peratacanta*, but if changes like this were allowed to be made where would they stop!

Greenley and Crag lakes, Northumberland, and Wynyard and Hardwick (Sedgefield) lakes, and a pond at Bishop Middleham (A. M. N.); Ryton-on-Tyne, Cleadon Farm pond, and Axwell Park (G. S. B.) N.D.

PLEUROXUS LÆVIS G. O. Sars.

1861. *Lynceus lævis*, Norman and Brady, l.c., p. 389, pl. xviii., fig. 5, and pl. xxi., fig. 14.

1901. *Pleuroxus lævis*, Lilljeborg, l.c., p. 529, pl. lxxiii., figs. 21, 22, and pl. lxxiv., figs. 1–5.

Crag Lake, Northumberland, and Hell Kettles, near Darlington (G. S. B.) N.D.

PLEUROXUS ADUNCUS (Jurine).

1867. *Lynceus trigonellus*, Norman and Brady, l.c., p. 391, pl. xxi., fig. 11.

1901. *Lynceus aduncus*, Lilljeborg, l.c., p. 541, pl. lxxv., figs. 11–17.

Crag Lake, Holy Island, Hardwick Lake Sedgefield (A.M.N.) N.D.

PLEUROXUS TRIGONELLUS (O. F. Müller).

1863. *Pleuroxus trigonellus*, Schödler, Neue Beit. z. Naturgesch. d. Cladoceren, p. 44, pl. ii., figs. 33–36.

1863. *Pleuroxus ornatus*, id. ibid, p. 47, pl. ii., fig. 32.

1874. *Pleuroxus trigonellus*, Kurz, Dodekas neuer Cladoceren, &c., p. 67 (separate copy), pl. iii., figs. 2–5.

1901. *Pleuroxus trigonellus*, Lilljeborg, l.c., p. 534, pl. lxxiv., figs. 13–23.

The Forge Dam, Sedgefield (A. M. N.); pond near Sunderland Cemetery, Hesleden Engine Pond near Seaham (G. S. B.) We question whether this and the preceding should be regarded as more than varieties. D.

PLEUROXUS UNCINATUS Baird.

1850. *Pleuroxus uncinatus*, Baird, Brit. Entom., p. 135, pl. xvii., fig. 4.

1860. *Pleuroxus personatus*, Leydig, Naturgesch. d. Daphniden, p. 227, pl. x., fig. 70.

1863. *Rhypophilus glaber*, *uncinatus*, and *personatus*, Schödler, Neue Beit. z. Naturgesch. d. Cladoceren, pp. 55, 56, pl. iii., figs. 54–56 (*R. glaber*).

1867. *Lynceus uncinatus*, Norman and Brady, l.c., p. 393, pl. xviii., fig. 9, pl. xxi., fig. 13.

1901. *Pleuroxus uncinatus*, Lilljeborg, l.c., p. 537, pl. lxxv., figs. 1–10.

Greenley Lake, Hardwick Lake Sedgefield (A. M. N.); East Belsay and Wallington Lakes (G. S. B.) N.D.

CHYDORUS GLOBOSUS Baird.

1843. *Chydorus globosus*, Baird, Ann. and Mag. Nat. Hist., vol. xi., p. 90, pl. iii., figs. 1–4.

1848. *Lynceus tenuirostratus*, S. Fischer, Uber die in d. Umgeb. von St. Petersburg vorkom. Crust., p. 193, pl. x., fig. 3.

1867. *Lynceus globosus*, Norman and Brady, l.c., p. 398, pl. xx., fig. 5.

1901. *Chydorus globosus*, Lilljeborg, l.c., p. 547, pl. lxxv., figs. 18–27, pl. lxxvi., fig. 1.

Crag Lake (A. M. N. and G. S. B.) N.

CHYDORUS SPHÆRICUS (O. F. Müller).

1867. *Lynceus sphæricus*, Norman and Brady, l.c., p. 399, pl. xxi., fig. 12.

1901. *Chydorus sphæricus*, Lilljeborg, l.c., p. 561, pl. lxxvii., figs. 8–25.

Abundant everywhere. N.D.

VAR. CŒLATUS Schödler.

Greenley Lake; Sedgefield (A. M. N.); pond on Warden Law (G. S. B.) N.D.

Monospilus dispar G. O. Sars.

1854. *Lynceus tenuirostris*, S. Fischer, Bull. de Soc. Imp. de Nat. de Moscou, p. 427, pl. iii., figs. 7–10 (but not *Lynceus tenuirostris*, S. Fischer, 1851).

1861. *Monospilus dispar*, G. O. Sars, Om de i Omengen af Christ. forkom. Cladocerer, p. 23.

1867. *Monospilus tenuirostris*, Norman and Brady, l.c., p. 403, pl. xix., fig. 2, pl. xx., fig. 9.

1901. *Monospilus dispar*, Lilljeborg, l.c., p. 581, pl. lxxviii., figs. 26–31, pl. lxxix., figs. 1–6.

East Belsay Lake, Northumberland (G. S. B.) N.

Division II.—GYMNOMERA G. O. Sars

Section III.—ONYCHOPODA G. O. Sars

Fam. 1.—POLYPHEMIDÆ

Polyphemus pediculus (Linné).

1850. *Polyphemus pediculus*, Baird, Brit. Entom., p. 111, pl. xvii., fig. 1.

1901. *Polyphemus pediculus*, Lilljeborg, l.c., p. 595, pl. lxxix., figs. 22–31, pl. lxxx., figs. 1–9.

In lakes, Crag, Grindon, Broomley, and Greenley, and Hardwick Lake Sedgefield. N.D.

Podon intermedius Lilljeborg.

1853. *Podon intermedius*, Lilljeborg, De Crust. ex Ord. tribus Clad., Ostrac. et Cop., &c., p. 161.

1867. *Podon intermedius*, P. E. Müller, Danmarks Cladocera, p. 215, pl. v., fig. 22, pl. vi., figs. 1–4.

1901. *Podon intermedius*, Lilljeborg, l.c., p. 627, pl. lxxxiv., figs. 8–16, pl. lxxxv., figs. 1–6.

Occasionally taken in the tow net. N.D.

PODON POLYPHEMOIDES (Leuckart).

1859. *Evadne polyphemoides*, Leuckart, Carcinologisches. Archiv f. Naturgesch., 25er Jahrg., p. 262, pl. vii., fig. 5.

1862. *Pleopis minutus*, G. O. Sars, Om de i Omengen af Christ. forekom. Cladocerer, p. 46.

1865. *Podon Mecznikowii*, Czerniavski, Materialia ad Zoograp. ponticam comparatam, p. 59.

1901. *Podon polyphemoides*, Lilljeborg, l.c., p. 633, pl. lxxxv., figs. 7–11.

First taken on our coasts by G. S. B. in 1866 in the estuary of the Tees, and since frequently off the coasts. N.D.

EVADNE NORDMANNI S. Lovén.

1850. *Evadne Nordmanni*, Baird, Brit. Entom., p. 114, pl. xvii., fig. 1.

1901. *Evadne Nordmanni*, Lilljeborg, l.c., p. 641, pl. lxxxv., figs. 4–17.

Not rare off the coasts. N.D.

(The middle of the Northumberland lakes has never been examined. It is not improbable that some of the "plankton" species will reward research there).

ORDER VIII.—OSTRACODA

The following are the chief works referred to in the list of Ostracoda:

1. Brady (G. S.). Monograph of Recent British Ostracoda. Trans. Linn. Soc., vol. xxvi., 1868.

2. Brady (G. S.) and Norman (A. M.). Monograph of the Marine and Freshwater Ostracoda of the North Atlantic and North-Western Europe, Section I., Podocopa. Scient. Trans. Royal Dublin Soc., ser. 2, vol. iv., 1889.

3. Brady (G. S.) and Norman (A. M.). Same as above, Pt. II. Scient. Trans. Royal Dublin Soc., ser. 2, vol. v., 1896.

4. Müller (G. W.). Zoologica, Heft 30, Deutschlands Süsswasser-Ostracoden, 1900.

5. Kaufmann (A.). Cypriden und Darwinuliden (Revue Suisse de Zoologie, vol. viii., 1900).

6. Hartwig (W.). Arten der Ostracoden-Unterfamilie Candoninæ der Provinz Brandenburg (Sitz.-Bericht d. Gesellsch. naturf. Freunde zu Berlin), 1901.

Section I.—PODOCOPA

Fam. 1.—CYPRIDIDÆ

Cypria ophthalmica (Jurine).

Common in ditches and ponds and at the margins of lakes. N.D.

Cypria exsculpta (S. Fischer)=*Cypris striolata* G. S. Brady =*Cypris granulata* (the young) D. Robertson.

Seaton Carew, Co. Durham; Newbiggin (A. M. N.); Greenley Lake (G. S. B.) N.D.

Cyclocypris globosa (G. O. Sars)=*Cypris cinerea* G. S. Brady.

Newbiggin; Broomley and Crag Lakes (A. M. N.) N.

Cyclocypris serena (Koch).

1889. *Cypria serena*, Brady and Norman (2), p. 70.

1896. *Cyclocypris serena*, Brady and Norman (3), p. 718.

Common in ditches, ponds, and lakes. N.D.

Cyclocypris lævis (O. F. Müller)=*Cypris minuta* Baird=*Cypris ovum* G. S. Brady.

1889. *Cypria lævis*, Brady and Norman (2), p. 18.

1896. *Cyclocypris lævis*, Brady and Norman (3), p. 728.

Common everywhere. N.D.

Cypris fuscata (Jurine)=*Cypris fusca* and *hispida* Baird.

1864. *Cypris oblonga*, G. S. Brady, Trans. Tyneside Nat. Field Club, vol. vi., p. 104, pl. ii., figs. 1–4.

An abundant species in small pieces of water. N.D.

Cypris obliqua G. S. Brady.

Rothley and Belsay Lakes, Northumberland (G. S. B.); Crag Lake (A. M. N.) N.

CYPRIS RETICULATA Zaddach=*Cypris affinis* Fischer and Lilljeborg.

1865. *Cypris tessellata*, G. S. Brady (partim) (1), p. 366.

1889. *Cypris reticulata*, Brady and Norman (2), p. 76, pl. viii., figs. 1, 2, pl. xi., figs. 5–7.

Sedgefield (A. M. N.); Fenham and Boldon Flats (G. S. B.) N.D.

CYPRIS VIRENS (Jurine)=*C. tristriata* Baird.

A common inhabitant of small grassy pools and ditches which dry up in summer. N.D.

CYPRIS PUBERA O. F. Müller.

1863. *Cypris punctillata*, Norman, Trans. Tyneside Nat. Field Club, vol. v., p. 145, pl. iii., figs. 11–14.

Taken in great abundance and very fine in the Forge Dam, Sedgefield, in 1861 (A. M. N.); pond at Seaton Marsh, Co. Durham (G. S. B.). It is a rare species. D.

CYPRIS ORNATA O. F. Müller.

The only known British specimens of this species were taken by G. S. B. in a pond near Shotton Hall, Co. Durham. D.

CYPRIS ELLIPTICA Baird=*C. hirsuta* S. Fischer.

1889. *Cypris elliptica*, Brady and Norman (2), p. 75, pl. ix., figs. 5, 6, pl. xi., fig. 12.

In a pond at Foxton Lane, Sedgefield (A. M. N.); and at Stocksfield, where it was found by Mr. H. B. Watson (G. S. B.) N.D.

CYPRINOTUS INCONGRUENS (Rambohr).

1896. *Cypris incongruens*, Brady and Norman (3), p. 721, pl. lxiv., figs. 17, 18, pl. lxviii., figs. 22, 23 ♂.

This species seems to like a slight admixture of salt in the water which it frequents. Seaton Delaval, Northumberland; Rainton and Seaton Carew, Co. Durham (A. M. N.) N.D.

CYPRINOTUS PRASINUS (S. Fischer).

1889. *Cypris prasina*, Brady and Norman (2), p. 78.

1896. *Cyprinotus prasinus*, Brady and Norman (3), p. 722.

Cooling ponds at Monkwearmouth Colliery, and in a salt marsh north of the river Coquet below Warkworth (G. S. B.); Seaton Delaval, Northumberland, and Rainton Meadows, Co. Durham (A. M. N.) This species requires apparently a certain amount of salt in the water which it inhabits. Canon Norman has taken the species in the Botanical Gardens at Palermo, Sicily, whence the type specimens of S. Fischer came. N.D.

Ilyocypris bistrigata (Jurine).

1866. *Cypris gibba*, Brady (partim) (1), p. 369, pl. xxiv., figs. 47–49.

1889. *Ilyocypris gibba*, Brady and Norman (partim) (2), p. 105.

1890. *Ilyocypris Bradyi*, G. O. Sars, "Oversigt af Norges Crustaceer. Branch., Ostrac., Cirrip.," p. 50.

1891. *Ilyocypris gibba*, var. *repens*, Vavra, Monog. der Ostracoden Böhmens, p. 60, fig. 18.

1896. *Ilyocypris Bradii*, Brady and Norman (3), p. 728, pl. lxiii., figs. 22, 23, pl. lxviii., figs. 18, 19.

1900. *Ilyocypris Bradyi*, G. W. Müller (4), p. 90, pl. xix., figs. 11–19, pl. xx., figs. 17, 18.

1900. *Ilyocypris Bradyi*, Kaufmann (5), p. 353, pl. xxiv., figs. 1, 2, pl. xxv., figs. 17, 18.

Dr. A. Kaufmann (Cypriden und Darwinuliden) has divided what used to be considered *Cypris gibba* into no less than five species; whether these forms are really of specific value further investigations must determine. Meanwhile we include under the name *Ilyocypris bistrigata* the forms which have the swimming setæ shorter than the following joint, and which are assigned by Kaufmann to two of his species, namely, *I. Bradyi* and *I. iners*. Our local specimens are referable only to the former species.

A common species. Among other localities we have specimens from Newbiggin and Seaton Delaval, Northumberland; Lambton Park, Rainton Meadows, and Seaton Carew, Co. Durham. N.D.

HERPETOCYPRIS REPTANS (Baird)=*Candona virescens* G. S. Brady (the young).

Dr. Kaufmann has described several species which are nearly allied to this. Very common, especially in grassy pools and ditches, but also found in lakes. N.D.

HERPETOCYPRIS STRIGATA (O. F. Müller).

Rare in the British Islands. In the burn at Fulwell Cemetery, Sunderland (G. S. B.) D.

HERPETOCYPRIS TUMEFACTA (Brady and Robertson).

Warn Burn and the Coquet, Northumberland (Brady and Robertson); near Sunderland (G. S. B.) N.D.

PRIONOCYPRIS SERRATA (Norman)=*Cypris bicolor* W. Müller=*Cypris Zenckeri* Toth and Chyzer.

1863. *Candona serrata*, Norman, Trans. Tyneside Nat. Field Club, vol. v., p. 148, pl. iii., figs. 1–6.

1889. *Herpetocypris serrata*, Brady and Norman (2), p. 57.

1896. *Prionocypris serrata*, Brady and Norman (3), p. 725.

1900. *Prionocypris serrata*, Kaufmann (5), p. 297, pl. xx., figs. 10–12, pl. xxi., figs. 22–26.

1900. *Cypris serrata*, G. W. Müller (4), p. 72, pl. xiv., figs. 3, 11, 14.

Very abundant in the Forge Dam at Sedgefield (A. M. N.); Fardingslake, near Marsden (G. S. B.) D.

ILYODROMUS ROBERTSONI (Brady and Norman).

1889. *Erpetocypris Robertsoni* Brady and Norman (2), p. 88, woodcut.

1896. *Ilyodromus Robertsoni*, Brady and Norman (3), p. 724.

In a shallow ditch by the side of the road between Haydon Bridge and Staward (G. S. B.) N.

CYPRIDOPSIS ACULEATA (O. G. Costa).

1863. *Cypris aculeata*, Norman, Trans. Tyneside Nat. Field Club, vol. v., p. 147, pl. iii., figs. 7–9.

C. aculeata Costa from Naples was subsequently given the very same name by Lilljeborg from Sweden.

Seaton Carew and Cowpen Marshes, Co. Durham; Newbiggin (A. M. N.); Monkwearmouth Colliery Pond, Hylton Dene, and Warkworth (G. S. B.) N.D.

Cypridopsis villosa (Jurine).

Very abundant in the Forge Dam, Sedgefield; Rainton Meadows, Co. Durham; Newbiggin (A. M. N.); Belsay East Lake (now drained) and near Crag Lake; Silksworth, and Fulwell (G. S. B.) N.D.

Pionocypris vidua (O. F. Müller).

1896. *Pionocypris vidua*, Brady and Norman (3), p. 726.

Common in small ponds of clean water, and in lakes. N.D.

Pionocypris obesa (Brady and Robertson).

1895. *Pionocypris obesa*, Brady and Norman (3), p. 726.

Fulwell Cemetery, near Sunderland (G. S. B.) D.

Proteocypris salina G. S. Brady.

1907. *Proteocypris salina*, Brady (G. S.), Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne, new ser. vol. i., p. 334, pl. x., figs. 1–12.

This species was described from specimens taken in a salt-water pond at Amble, Northumberland (G. S. B.) N.

Potamocypris fulva G. S. Brady.

Fulwell Cemetery, and near the mouths of several rivers in Northumberland—Warn Burn, rivers Coquet, Wansbeck, and Blyth (G. S. B.) N.D.

Notodromas monacha (O. F. Müller).

Fishburn, Co. Durham (A. M. N.); many places in the counties of Northumberland and Durham (G. S. B.) N.D.

Candona candida (O. F. Müller).

Foreign authors (Hartwig, Kaufmann, and G. W. Müller) have described a large number of forms as species allied to *C. candida* and *C. compressa*; and certainly either *C. candida* is an extremely variable form or several species have in the past been improperly associated under that name.

Very common in ditches, ponds, and lakes. N.D.

CANDONA NEGLECTA G. O. Sars.

1887. *Candona neglecta*, G. O. Sars, Nye Bidrag til Kundskaben om Middelhavets Invert. Fauna, IV., Ostracoda Mediterranea, p. 279, pl. xv., figs. 5–7, pl. xix., figs. 1–21.

1889. *Candona candida*, var. *neglecta*, Brady and Norman (2), p. 99, pl. x., figs. 18–21.

1891. *Candona fabæformis*, Vavra (not Fischer), Mon. der Ostracoden Böhmens, p. 45.

1898. *Candona Vavrai*, Hartwig, "In Candona fabæformis stecken drei verschiedene Arten." Zoolog. Anzeiger, vol xxi., p. 566.

1900. *Candona neglecta*, Kaufmann (5), p. 387, pl. xxix., figs. 1–5, pl. xxx., figs. 12–18, pl. xxxi., fig. 21.

1900. *Candona neglecta*, G. W. Müller (4), p. 17, pl. ii., figs. 4–6, 13–18.

Chester Road, Sunderland (G. S. B.)

Further research will probably prove that this species, hitherto confounded with *C. candida*, is widely distributed in the two counties. D.

CANDONA CLAVIFORMIS Brady and Norman.

1889. *Candona candida*, var. *claviformis*, Brady and Norman, Mon. Marine and Freshwater Ostracoda, &c. Trans. Roy. Dublin Soc., ser. 2, vol. iv., p. 98, pl. x., fig. 1 ♂.

Taken several times in years 1859–68 in a pond in a field adjoining the Rectory at Sedgefield, Co. Durham, and subsequently near Seaton Delaval (A. M. N.). The two sexes will shortly be described and figured in a paper which Dr. Brady has in preparation on the genus Candona. N.D.

CANDONA CAUDATA Kaufmann.

1892. *Candona acuminata*, Kaufmann, Die Ostracoden der Umgebung Berns. Mittlg. d. naturf. Ges. Bern, p. 70.

1900. *Candona caudata*, Kaufmann, Cypriden und Darwinuliden der Schweiz. Revue Suisse de Zoologie, vol. viii., p. 365, pl. xxiv., figs. 16–20, pl. xxvi., figs. 17–23.

East Lake at Belsay, Northumberland (now drained and built over) (G. S. B.) N.

CANDONA ZETLANDICA (Brady).

1868. *Cytheridea zetlandica*, Brady (1), p. 428, pl. xxviii., figs. 42–46.

1870. *Candona candida*, var. *tumida*, Brady and Robertson, Ann. and Mag. Nat. Hist., ser. 4, vol. vi., p. 16, pl. ix., figs. 13–15.

1889. *Candona candida*, var. *tumida*, Brady and Norman (2), p. 99, pl. x., figs. 14–17.

1898. *Candona Weltneri*, Hartwig, Eine neue Candona aus der Provinz Brandenburg. Sitz. der Gesellsch. naturfor. Freunde zu Berlin, vol. xxi., p. 50.

1900. *Candona Weltneri*, G. W. Müller (4), p. 16, pl. iii., figs. 3, 4, 13, 14, 17–20.

Rivers Coquet, Blyth, and Wansbeck, and Wark Burn, Belsay East Lake, Seaton Burn, and Alnmouth, Northumberland (G. S. B.) N.

CANDONA LACTEA Baird.

Sedgefield and Seaton Carew Marshes; Newbiggin (A. M. N.); Budle Bay and rivers Aln and Coquet (G. S. B.) N.D.

CANDONA ROSTRATA Brady and Norman.

This is not *C. rostrata* G. W. Müller which is *C. marchica* Hartwig.

Newbiggin (A. M. N.) N.

CANDONA COMPRESSA (Koch).

1864. *Candona albicans*, G. S. Brady, Trans. Tyneside Nat. Field Club, vol. vi., p. 107, pl. iii., figs. 6–10 (the young).

1868. *Candona compressa*, Brady (1), p. 382, pl. xxvi., figs. 22–27.

1889. *Candona pubescens*, Brady and Norman (2), p. 101, pl. xii., figs. 32–37.

1896. *Candona compressa*, Brady and Norman (3), p. 728.

1901. *Candona compressa*, Hartwig (6), p. 104.

Sedgefield, Seaton Carew Marshes, Rainton Meadows, pond in Lumley Dene (A. M. N.), Sunderland (G. S. B.) D.

CANDONA ZENCKERI G. O. Sars.

1890. *Candona Zenckeri*, G. O. Sars, "Oversigt. af Norges Crustaceer, II., Branch., Ostrac., Cirrip." Vidensk.-Selsk. Forhand., p. 66.

1896. *Candona Zenckeri*, Brady and Norman (3), p. 739, pl. lxiii., fig. 25, pl. lxviii., figs. 12, 13.

The only specimens as yet known in Great Britain were taken in a pond near Ferry Hill (A. M. N.) D.

CANDONA STAGNALIS G. O. Sars.

1890. *Candona stagnalis*, G. O. Sars, "Oversigt. af Norges Crustaceer, II., Branch., Ostrac., Cirrip." Vidensk.-Selsk. Forhand., p. 69.

1891. *Candona ambigua*, T. Scott, "Invert. Fauna of Inland Waters of Scotland." Ninth Rep. Fish. Board Scotland, p. 277, pl. iv., figs. 7 a–c ♂.

1896. *Candona stagnalis*, Brady and Norman (3), p. 729, pl. lxviii., figs. 14–17.

1900. *Candona rara*, G. W. Müller (4), p. 22, pl. v., fig. 1, pl. vi., figs. 2, 3, 14–16.

1901. *Candona pubescens*, Hartwig (6), p. 96.

Found in a pool near Broomley Lake, Northumberland (A. M. N.) N.

CANDONOPSIS KINGSLEII (Brady and Robertson).

1889. *Candona Kingsleii*, Brady and Norman (2), p. 102, pl. ix., figs. 19–22, pl. xiii., fig. 19.

1891. *Candonopsis Kingsleii*, Vavra, Monog. der Ostracoden Böhmens, p. 54.

1900. *Candonopsis Kingsleii*, G. W. Müller (4), p. 38, pl. vi., figs. 23–28, pl. vii., figs. 22–25.

1900. *Candonopsis Kingsleii*, Kaufmann (5), p. 357, pl. xxiv., figs. 8–11, pl. xxvi., figs. 1–9, pl. xxxi., fig. 17.

1901. *Candonopsis Kingsleii*, Hartwig (6), p. 127.

Crag Lake, Northumberland (A. M. N.) N.

PONTOCYPRIS MYTILOIDES (Norman).

Not rare in the littoral and laminarian zones. N.D.

PONTOCYPRIS ACUPUNCTATA G. S. Brady.

Budle Bay, Northumberland, and off Marsden, Durham, 10 fathoms (G. S. B.) N.D.

PONTOCYPRIS TRIGONELLA G. O. Sars.

This species is apparently scarce on this coast. Budle Bay, Northumberland (G. S. B.) N.

ARGILLŒCIA CYLINDRICA G. O. Sars.

Off Seaham and Marsden (G. S. B.) D.

ARGILLŒCIA PROPINQUA G. S. Brady.

1903. *Argillœcia propinqua*, G. S. Brady, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new ser., vol. i., p. 7, pl. ii., figs. 1-8.

Twenty-five miles east of Alnmouth in 59 fathoms (G. S. B.) N.

FAM. 2.—CYTHERIDÆ

CYTHERE LUTEA O. F. Müller.

Abundant between tidemarks. N.D.

CYTHERE PELLUCIDA Baird=*Cythere castanea* G. O. Sars and Brady (olim.)

Common in salt-marshes and estuaries. N.D.

CYTHERE CONFUSA Brady and Norman=*Cythere pellucida* Brady et auct. (not Baird).

Dredged in comparatively deep water, 25–46 fathoms, and also common on muddy ground in estuaries and tidemarks. N.D.

CYTHERE PORCELLANEA G. S. Brady.

More frequently found than the last in estuaries, and dredged in shallow water. N.D.

CYTHERE TENERA G. S. Brady.

Generally dredged, but has been found by G. S. B. between tidemarks at Whitley and Cullercoats. N.D.

CYTHERE SEMIPUNCTATA G. S. Brady.

Budle Bay and Seaton Sluice, Northumberland, and off the coast of Durham (G. S. B.) N.D.

CYTHERE CRISPATA G. S. Brady.

Off Marsden, 10 fathoms (G. S. B.) D.

CYTHERE GIBBOSA Brady and Robertson.

Budle Bay and several estuarine situations on the Northumberland coast (G. S. B.). The Tweed above Berwick; river Lyne near Newbiggin; and marshes at Seaton Carew (A. M. N.) N.D.

CYTHERE ALBOMACULATA Baird.

Common between tidemarks, and recorded by G. S. B. from a freshwater lake at Bolam, Northumberland.

The Bolam habitat must be looked upon as doubtful; a renewed search there has resulted in failure to find the species, and it is possible that it found its way accidentally into the earlier gathering. N.D.

CYTHERE ROBERTSONI G. S. Brady.

Budle Bay, Northumberland; Sunderland, tidemarks, and in several places off the Durham coast in 29–55 fathoms (G. S. B.); Seaton Sluice (A. M. N.) N.D.

CYTHERE LIMICOLA (Norman).

1866. *Cythereis limicola*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 20, pl. vi., figs. 1–4.

Confined to the coralline zone, but not rare at such a depth off the coast. N.D.

CYTHERE CUNEIFORMIS G. S. Brady.

More generally found in 15–40 fathoms, but also occurs in several estuarine localities in Northumberland, and has been found between tidemarks on mud-covered rocks at Whitley (G. S. B.); Seaton Delaval (A. M. N.) N.D.

CYTHERE NAVICULA (Norman).

Budle Bay, Northumberland (G. S. B.) N.

CYTHERE VILLOSA (G. O. Sars).

Among small weeds between tidemarks in estuaries, and more rarely dredged.

The specimens referred to *C. borealis* Brady taken at Seaton Carew, belong really to *C. villosa*. N.D.

CYTHERE QUADRIDENTATA Baird.

Occasionally occurring in deep water off the coast. N.D.

CYTHERE EMACIATA G. S. Brady.

Found under similar circumstances to the last, but much rarer. N.D.

CYTHERE TUBERCULATA (G. O. Sars).

Frequent in deep water. On some parts of our coasts it is found living between tidemarks, but has not yet occurred under such circumstances on the north-east coast. N.D.

CYTHERE CONCINNA Rupert Jones.

Occasionally occurring in deep water. N.D.

CYTHERE FINMARCHICA (G. O. Sars).

Another deep water form which has been found off the coasts both of Northumberland and Durham. N.D.

CYTHERE ANGULATA (G. O. Sars).

Found off the coast in deep water, but rare. N.D.

CYTHERE DUNELMENSIS (Norman).

1865. *Cythereis dunelmensis*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 22, pl. vii., figs. 1–4.

A fine species which is not rare in deep water off the north-east coasts. N.D.

CYTHERE JONESII (Baird).

1865. *Cythereis Jonesii*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 21, pl. vii., figs. 5–8.

Common in deep water, and the most beautiful representative of the genus in our fauna. N.D.

LIMNICYTHERE INOPINATA (Baird).

Hardwick Lake, Sedgefield, and Raby and Lambton Parks (A. M. N.); Fulwell Cemetery, Gibside, and in a millstream at Hedworth, Co. Durham, and in East Belsay Lake, Northumberland, and in many estuarine localities (G. S. B.) N.D.

CYTHERIDEA PAPILLOSA Bosquet.

1865. *Cythere debilis*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 15, pl. v., figs. 5–8.

In deep water, somewhat local, but common when found. N.D.

CYTHERIDEA PUNCTILLATA G. S. Brady.

Seaton Carew (G. S. B.) D.

CYTHERIDEA ELONGATA G. S. Brady.

On muddy rocks at low-water mark at Seaton Carew (G. S. B.) D.

CYTHERIDEA TOROSA (Rupert Jones).

1864. *Cyprideis torosa*, Brady, Trans. Tyneside Nat. Field Club, vol. vi., p. 108, pl. iii., figs. 11–23.

1868. *Cytheridea littoralis*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 6.

In brackish water, Warkworth, Alnmouth, Cambois, Seaton Sluice, and Jarrow Slake (G. S. B.); Hartlepool (A. M. N.). Inland in fresh water in the Forge Dam at Sedgefield (A. M. N.); and at Belsay (G. S. B.) N.D.

EUCYTHERE DECLIVIS (Norman).

1865. *Cythere declivis*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 16, pl. v., figs. 9–12.

In deep water off the coast, but not common. Both the varieties *argus* Sars and *anglica* Brady are found upon the coast. N.D.

KRITHE BARTONENSIS (Rupert Jones).

Taken by G. S. B. off both the Northumberland and Durham coasts in 30–60 fathoms, but very local. N.D.

LOXOCONCHA IMPRESSA (Baird).

Frequent in rock pools and estuaries, and in moderate depths off the coast. N.D.

LOXOCONCHA VIRIDIS (O. F. Müller).

This is *Cythere rhomboidea* S. Fischer and *Loxoconcha elliptica* G. S. Brady.

Essentially a brackish water species. Rivers Aln, Coquet, Wansbeck, and Blyth (G. S. B.); Seaton Sluice and Hartlepool (A. M. N.) N.D.

Loxoconcha multifora (Norman).

1865. *Cythere multifora*, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 18, pl. vi., figs. 13–16.

Off Holy Island, 1864 (A. M. N.); Budle Bay, Northumberland (G. S. B.) N.

Loxoconcha guttata (Norman).

1865. *Cythere guttata*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 19, pl. vi., figs. 9–12.

1870. *Loxoconcha granulata*, G. S. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 368, pl. xiii., figs. 5–7.

Dredged in 1864 off Holy Island, and also 10–15 miles off Seaham in about 40 fathoms (A. M. N.); 29 miles E. of Alnmouth in 59 fathoms, and several places off the Durham coast in 20–30 fathoms (G. S. B.) N.D.

Loxoconcha tamarindus (Rupert Jones).

1865. *Cythere lævata*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 18, pl. v., figs. 13–16.

Off Holy Island (A. M. N.); Northumberland and Durham coasts in tide-pools and in 30-46 fathoms, also in estuaries as Budle Bay and river Blyth (G. S. B.) N.D.

Loxoconcha pusilla Brady and Robertson.

Budle Bay and rivers Wansbeck and Blyth, Northumberland (G. S. B.); Seaton Delaval (A. M. N.) N.

Loxoconcha fragilis G. O. Sars.

Budle Bay, Northumberland (G. S. B.) N.

Xestoleberis aurantia (Baird).

Common between tidemarks and in estuaries. In 1891 G. S. B. took it at 29 miles E. of Alnmouth in 59 fathoms. N.D.

Xestoleberis depressa G. O. Sars.

The last is usually a tidemark species; this on the contrary is an inhabitant of the ultra-littoral region, and descends to deep water, where it is not uncommon. N.D.

CYTHERURA GIBBA (O. F. Müller).

Berwick-on-Tweed and Seaton Sluice, fine and abundant (A. M. N.); near the mouth of several Northumberland rivers (G. S. B.) N.

CYTHERURA CORNUTA G. S. Brady.

Berwick-on-Tweed (A. M. N.); between tidemarks at Boulmer, Northumberland (G. S. B.) N.

CYTHERURA SELLA G. O. Sars.

This is *C. cuneata* ♂ and *C. flavescens* ♀ of Brady.

Common between tidemarks and in estuaries. N.D.

CYTHERURA ACUTICOSTATA G. O. Sars.

Tidemarks, but not common; also river Blyth and off Holy Island; Hawthorn and Castle Eden in 20 fathoms (G. S. B.) N.D.

CYTHERURA STRIATA G. O. Sars.

Cytherura quadrata Norman is the female of this species.

Common between tidemarks, amidst the fine weeds and Corallina; as well as dredged. N.D.

CYTHERURA ANGULATA G. S. Brady.

Tidemarks, and dredged, but a much scarcer species than the last; also in estuaries, as those of the rivers Blyth and Wansbeck (G. S. B.); Seaton Delaval, tidemarks (A. M. N.) N.D.

CYTHERURA UNDATA G. O. Sars.

This is seldom abundant, but distributed; more usually in the coralline zone, but also in estuaries, as those of the rivers Wansbeck and Blyth (G. S. B.) N.D.

CYTHERURA PRODUCTA G. S. Brady.

Off the Durham coast, and at the mouth of the Aln (G. S. B.) N.D.

CYTHERURA NIGRESCENS (Baird).

The commonest Cytherura between tidemarks, where it may be met with almost everywhere. N.D.

CYTHERURA CONCENTRICA Brady, Crosskey and Robertson.

Seaton Delaval and Hartlepool (G. S. B.) N.D.

CYTHERURA SIMILIS G. O. Sars.

This is *Cytherura Sarsii* Brady and *Cytherura propinqua* Brady and Robertson.

Seaton Delaval, tidemarks (A. M. N.); Boulmer; off Seaham Harbour; and at low-water mark at Seaton Carew (G. S. B.) N.D.

CYTHERURA FULVA Brady and Robertson.

In 20–30 fathoms off the Durham coast, and between tidemarks at Boulmer, Northumberland (G. S. B.); Seaton Delaval, between tidemarks (A. M. N.) N.D.

CYTHERURA CLATHRATA G. O. Sars.

Between tidemarks at Whitley and Seaton Sluice, and dredged off Hawthorn in 20 fathoms (G. S. B.) N.D.

CYTHERURA CELLULOSA (Norman).

1865. *Cythere cellulosa*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 22, pl. v., figs. 17–20, and pl. vi., fig. 17.

Between tidemarks and dredged, not rare. N.D.

CYTHEROPTERON LATISSIMUM (Norman).

1865. *Cythere latissima*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 19, pl. vi., figs. 5–8.

Off Holy Island, and on the Dogger Bank, and off Seaham (A. M. N.); twenty-nine miles E. of Alnmouth in 49–60 fathoms, and off Souter Point in 30–39 fathoms, abundant and fine (G. S. B.) N.D.

CYTHEROPTERON ALATUM G. O. Sars.

Very rare, 30 miles off Sunderland in 40–45 fathoms (G. S. B.) D.

CYTHEROPTERON NODOSUM G. S. Brady.

On the Dogger Bank (A. M. N.); mouth of the Wansbeck river and off the coast of Durham (G. S. B.) N.D.

BYTHOCYTHERE TURGIDA G. O. Sars.

1870. *Bythocythere turgida*, G. S. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 372, pl. xiii., figs. 1–4.

Twenty-nine miles E. of Alnmouth in 59 fathoms; off Souter Point in 30–40 fathoms (G. S. B.) N.D.

BYTHOCYTHERE CONSTRICTA G. O. Sars.

Off the Durham coast in 20–35 fathoms, and also off Northumberland (G. S. B.) N.D.

BYTHOCYTHERE SIMPLEX (Norman).

1865. *Cythere simplex*, Norman, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 17, pl. v., figs. 1–4.

The types were dredged in 1862 about 100 miles off Tynemouth, and it was again taken in 1864 off Holy Island (A. M. N.). In several places off the Durham coast in 20–40 fathoms, twenty-nine miles E. of Alnmouth in 40–60 fathoms, and off Souter Point in 30–40 fathoms (G. S. B.). Living specimens in very fine condition were taken during the dredging excursions of 1901–2, generally associated with equally fine captures of *Cythere Jonesii*. N.D.

PSEUDOCYTHERE CAUDATA G. O. Sars.

Occasionally dredged, but not common. N.D.

SCLEROCHILUS CONTORTUS (Norman).

Off the coasts in 20–46 fathoms, and also between tidemarks. N.D.

CYTHERIDEIS SUBULATA G. S. Brady.

Boulmer, near Whitley, Northumberland; Sunderland and Seaton Carew (G. S. B.); Seaton Delaval (A. M. N.); tidemarks and shallow water. N.D.

CYTHEROIS FISCHERI (G. O. Sars).

1870. *Paradoxostoma Fischeri*, G. S. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 362, pl. xii., figs. 10, 11.

Budle Bay, Boulmer, Seaton Delaval, Northumberland; Sunderland; off Marsden and Seaham 33–35 fathoms (G. S. B.); Warkworth (A. M. N.) N.D.

FAM. 3.—PARADOXOSTOMATIDÆ

PARADOXOSTOMA VARIABILE (Baird).

Abundant between tidemarks and in shallow water. N.D.

PARADOXOSTOMA ENSIFORME G. S. Brady.

Frequent between tidemarks. N.D.

PARADOXOSTOMA ABBREVIATUM G. O. Sars.

Tidemarks Budle Bay, Boulmer, and Seaton Carew; 20 fathoms off Hawthorn (G. S. B.) N.D.

PARADOXOSTOMA OBLIQUUM G. O. Sars.

Muddy rocks at low water, Whitley (G. S. B.); Seaton Delaval (A. M. N.) N.D.

PARADOXOSTOMA NORMANI G. S. Brady.

Seaton Sluice and Budle Bay, Northumberland; off the Durham coast 10–20 fathoms (G. S. B.) N.D.

PARADOXOSTOMA PULCHELLUM G. O. Sars.

1870. *Paradoxostoma pulchellum*, G. S. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 363, pl. xii., figs. 4, 5.

Boulmer, Seaton Carew, Hartlepool, all tidemarks (G. S. B.) N.D.

PARADOXOSTOMA HIBERNICUM G. S. Brady.

1870. *Paradoxostoma hibernicum*, G. S. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 362, pl. xii., figs. 10, 11.

Boulmer, tidemarks, and Seaton Delaval (G. S. B.) N.

PARADOXOSTOMA HODGEI G. S. Brady.

1870. *Paradoxostoma Hodgei*, G. S. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 371, pl. xii., figs. 12, 13.

Off Seaham Harbour (G. S. B.) D.

PARADOXOSTOMA FLEXUOSUM G. S. Brady.

Off the coast and in estuarine mud, but not common. N.D.

MACHÆRINA TENUISSIMA (Norman).

1870. *Xiphichilus tenuissimus*, G. S. Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 369, pl. xii., figs. 6–9, and pl. xiv., figs. 5–10.

Fourteen miles off Seaham, 35 fathoms, and 5–17 miles off Souter Point, 30–60 fathoms (G. S. B.) D.

Section II.—MYODOCOPA

Fam. 1.—ASTEROPIDÆ

Asterope teres (Norman).

Fourteen miles off Seaham in 35 fathoms (G. S. B.) D.

Asterope Mariæ (Baird).

About 30 miles off Alnmouth in 39 fathoms (G. S. B.) N.

Fam. 2.—CYPRIDINIDÆ

Philomedes brenda (Baird).

Forty to fifty miles off Tynemouth, and off the coast of Durham near the Dogger Bank (A. M. N.); 14 miles off Seaham in 35 fathoms, and 25 miles east of Alnmouth in 50 fathoms (G. S. B.) N.D.

Philomedes interpuncta (Baird).

Off Northumberland in deep water (A. M. N.); off Marsden, Hawthorn, and Sunderland, 20–45 fathoms (G. S. B.) N.D.

Section III.—CLADOCOPA

Fam. 1.—POLYCOPIDÆ

Polycope orbicularis G. O. Sars.

Several places off the coast of Durham (G. S. B.) N.

Section IV.—PLATYCOPA

Fam. 1.—CYTHERELLIDÆ

Cytherella serrulata Brady and Norman.

About 30 miles off Alnmouth in 39 fathoms (G. S. B.) N.

Cytherella abyssorum G. O. Sars.

This is *C. scotica* G. S. Brady.

Fourteen miles off Seaham in 35 fathoms (G. S. B.) D.

Order IX.—COPEPODA

For information as to the British species of Copepoda the following works will be found useful. These are referred to in the synonymy by the numerals attached to each.

1. Baird (W.). Natural History of the British Entomostraca, London, Ray Society, 1850.

2. Claus (Dr. C.). Die frei lebenden Copepoden, mit besonderer Berücksichtigung der Fauna Deutschlands, der Nordsee und des Mittelmeeres, Leipzig, 1863.
3. Brady (G. S.). A monograph of the free and semi-parasitic Copepoda of the British Islands, 3 vols., London, Ray Society, 1878–80.
4. Brady (G. S.). A revision of the British species of fresh-water Cyclopidæ and Calanidæ. Nat. Hist. Trans. Northumberland and Durham, vol. xi., 1891.
5. Giesbrecht (Dr. Wilhelm). Systematik und Faunistik der pelagischen Copepoden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte, Berlin, 1892.
6. Sars (G. O.). An Account of the Crustacea of Norway, vols. iv., v., Copepoda, 1904–9 (in course of publication).
7. Norman (A. M.) and Scott (T.). The Crustacea of Devon and Cornwall, 1906.

Scott (T. and A.). Numerous papers chiefly in the Annual Reports of the Fishery Board for Scotland.

The classification here adopted for the Copepoda is based chiefly on that used by Professor G. O. Sars in his work on the "Crustacea of Norway" now in course of publication.

Section I.—CALANOIDA

Fam. 1.—CALANIDÆ

Calanus septentrionalis (H. Goodsir).

1843. *Cetochilus septentrionalis*, Goodsir, Edinburgh New Philos. Journ., xxxv., p. 336, pl. vi., figs. 1–11.
1863. *Cetochilus helgolandicus*, Claus (2), p. 171, pl. xxvi., figs. 2–9.
1878. *Calanus finmarchicus*, Brady (3), vol. i., p. 38, pl. i., figs. 1–12.
1901. *Calanus helgolandicus*, G. O. Sars (6), vol. iv., p. 11, pl. iv.
1906. *Cetochilus septentrionalis*, Norman and Scott (7), p. 126.

This species, hitherto referred by most authors to *Monoculus finmarchicus* Gunner, is considered by Professor G. O. Sars to be distinct, Gunner's description referring to a closely allied form which is chiefly Arctic in its distribution, and differs in its greater size and in some not very important structural details.* So far as we at present know the true *C. finmarchicus* does not occur in our district. *C. septentrionalis*, on the contrary, is often found in immense numbers, usually near the surface in the open sea, but often also in pools of the littoral zone where it has doubtless been left behind by the retreating tide. N.D.

Fam. 2.—PSEUDOCALANIDÆ

Pseudocalanus elongatus Boeck.

1865. *Calanus Clausii*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 33, pl. i., figs. 1, 11–13.

1878. *Pseudocalanus elongatus*, Brady (3), vol. i., p. 45 pl. iii., figs. 1–9.

Very common both in the open sea and in tidal pools. N.D.

Fam. 3.—CENTROPAGIDÆ

Centropages typicus Kröyer.

1863. *Ichthyophorba denticornis*, Claus (2), p. 199, pl. xxxv., figs. 1, 3–9.

1865. *Ichthyophorba denticornis*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 40, pl. iv., figs. 1–6.

1878. *Centropages typicus*, Brady (3), vol. i., p. 65, pl. viii., figs. 1–10.

1901. *Centropages typicus*, G. O. Sars (6), vol. iv., p. 75, pls. xlix., l., li. N.D.

* The British form was, however, described by H. Goodsir in 1843 under the specific name *septentrionalis*, and as pointed out in the "Crustacea of Devon and Cornwall," that name must be adopted if the still earlier one used by Gunner be held to apply to a different species.

CENTROPAGES HAMATUS (Lilljeborg).

1865. *Ichthyophorba hamata*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 39, pl. iv., figs. 7–10.

1878. *Centropages hamatus*, Brady (3), vol. i., p. 67, pl. viii., figs. 11–13.

1901. *Centropages hamatus*, G. O. Sars (6), vol. iv., p. 76, pl. lii.

The two foregoing species are of frequent occurrence in the open sea; less frequent in tidal pools. N.D.

ISIAS CLAVIPES Boeck.

1878. *Isias clavipes*, Brady (3), vol. i., p. 62, pl. vii., figs. 3–13.

1901. *Isias clavipes*, G. O. Sars (6), vol. iv., p. 79, pls. liii., liv.

This species, though generally distributed round the British Islands, had not been noted in our district until quite recently; but in several tow-net collections made during the summer of 1905 it occurred rather plentifully. N.D.

FAM. 4.—DIAPTOMIDÆ

DIAPTOMUS CASTOR (Jurine).

1875. *Diaptomus castor*, Brady (in part) (3), vol. i., p. 59, pl. vi., figs. 6–13, and (6) p. 92, pl. xi., figs. 1–6.

1901. *Diaptomus castor*, G. O. Sars (6), vol. iv., p. 85, pls. lvii., lviii.

This species is found for the most part in ponds and ditches—not so often in larger sheets of water; not common in our district, nor perhaps in any other part of the country. In ponds at Shotton, Sunderland, and Wardley (G. S. B.); Broomley Lake (A. M. N.) N.D.

DIAPTOMUS GRACILIS G. O. Sars.

1862. *Diaptomus gracilis*, G. O. Sars, Oversigt af de indenlandske Ferskvandscopepoder, p. 9.

1891. *Diaptomus gracilis*, Brady (4), p. 94, pl. xi., figs. 7–9, pl. xii., figs. 1–8.

1901. *Diaptomus gracilis*, G. O. Sars (6), vol. iv., p. 92, pl. lxiii.

Syn.: *Diaptomus Westwoodii*, Lubbock.

An almost exclusively lacustrine species which occurs abundantly in most of the English and Scottish lakes, and generally in ponds and still water. Very plentiful in Tindale and Talkin Tarns, which are just over the border of our restricted district, also in Crag Lake and Chartners Lake (A. M. N.). In Talkin Tarn we have seen the net come up from some few feet below the surface quite alive with shoals consisting chiefly of this species and *Eurytemora affinis* (G. S. B.) N.

Fam. 5.—TEMORIDÆ

Temora longicornis Müller.

1865. *Temora longicornis*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 36, pl. i., fig. 15, and pl. ii., figs. 1–10, and (3) vol. i., p. 54, pl. iii., figs. 10–19.

Syn.: *Temora finmarchica*, Baird; and *Diaptomus longicaudatus*, Lubbock.

This is one of the most abundant of the marine Copepoda. It occurs both in the littoral zone and in the open sea, more plentifully at most seasons than any other of the Calanoida, excepting, perhaps, *Calanus septentrionalis*. Easily recognised by its very long and slender caudal appendages. N.D.

Eurytemora velox (Lilljeborg).

1865. *Temora velox*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. i., p. 38, pl. i., fig. 16, and pl. iii., figs. 1–11, and (3) vol. i., p. 56, pl. vi., figs. 1–5.

1891. *Eurytemora Clausi*, Brady (4), p. 105, pl. xiii., figs. 1–5.

1901. *Eurytemora velox*, G. O. Sars (6), vol. iv., p. 100, pls. lxvii., lxviii.

Common, and often very abundant, in the pools of salt marshes, and (in other parts of the country) occasionally in fresh water. Not noticed in this district except in brackish

water. Hylton Dene (habitat now destroyed), Seaton Sluice, Alnmouth, Hartlepool, &c. (G. S. B.) N.D.

EURYTEMORA AFFINIS (Poppe).

1885. *Temorella affinis*, Poppe, Die freilebenden Copepoden des Jadebusens (Abhandl. des naturwissenschaft. Vereins zu Bremen, ix. Band), p. 184, Taf. vi., figs. 22-28.

1888. *Temorella affinis*, Poppe, var. *hirundoides*, Nordquist, Die Calaniden Finlands, Helsingfors, p. 48, Taf. iv., figs. 5–11.

1891. *Eurytemora affinis*, Brady (4), p. 107, pl. xiii., figs. 6–9.

1901. *Eurytemora hirundoides*, G. O. Sars (6), vol. iv., p. 102, pl. lxix.

Between the typical *Temorella affinis* and the variety *hirundoides*—promoted by Prof. G. O. Sars to the rank of a species—the differences seem to be of degree only, depending upon the amount of development of the posterior angles of the metasome, the hirsute furniture of the furca and some other very slight variations. It seems better to look upon all these forms as belonging to one and the same species. Our only local record is "brackish water ditches at Hartlepool" (A. M. N.) D.

FAM. 6.—METRIDIIDÆ

METRIDIA LUCENS Boeck.

1878. *Metridia armata*, Brady (3), vol. i., p. 42, pl. ii., figs. 1–12, vol. ii., pl. lvi., figs. 19, 20.

1892. *Metridia hibernica*, Giesbrecht (5), p. 345, pl. xxxii., fig. 11, pl. xxxiii., figs. 2, 12, 16, 22, 28, 36, 39.

Syn.: *Paracalanus hibernicus* Brady and Robertson.

The British species assigned in the Ray Society Monograph to *Metridia armata* Boeck is said by G. O. Sars not to belong to that species, but to *M. lucens* Boeck. We therefore adopt that view, and are able to include it as taken off North Sunderland, and also three miles off Ryhope (G. S. B.) N.D.

Fam. 7.—PSEUDOCYCLOPIDÆ

Pseudocyclops crassiremis Brady.

1878. *Pseudocyclops crassiremis*, Brady (3), vol. i., p. 82, pl. vii., figs. 1, 2, pl. xii., fig. 14.

The type of this species was taken off Seaham Harbour in a depth of twenty to thirty fathoms—one specimen only. D.

Fam. 8.—PONTELLIDÆ

Anomalocera Patersonii Templeton.

1850. *Anomalocera Patersonii*, Baird (1), p. 229, pl. xxvii., figs. 1a–i, 2a–c.

1863. *Irenæus Patersonii*, Claus (2), p. 206, pl. ii., fig. 1, pl. xxxvii., figs. 1–6.

1878. *Anomalocera Patersonii*, Brady (3), vol. i., p. 75, pl. xi., figs. 1–14, pl. x., figs. 13, 14.

A purely pelagic species, occurring occasionally in great numbers, at other times only sparingly. Taken at all points of the coast. N.D.

Fam. 9.—PARAPONTELLIDÆ

Parapontella brevicornis (Lubbock).

1857. *Pontella brevicornis*, Lubbock, Ann. and Mag. Nat. Hist., 2nd ser., vol. xx., pl. xi., figs. 4–8.

1878. *Parapontella brevicornis*, Brady (3), vol. i., p. 69, pl. ix., figs. 1–16.

This, like the preceding species, is at times very abundant in the open sea, generally not very far from shore; it is found also not very unfrequently, but in smaller numbers, between tidemarks. N.D.

Fam. 10.—ACARTIIDÆ

Acartia Clausi Giesbrecht.

1878. *Dias longiremis*, Brady (in part) (3), vol. i., p. 51, pl. v., figs. 1–14.

1892. *Acartia Clausi*, Giesbrecht (5), p. 507, pl. xxx., figs. 2, 4, 13–15, 17, 28, 36, 47, pl. xlii., fig. 32, pl. xliii., figs. 3, 5, 14.

1901. *Acartia Clausi*, G. O. Sars (6), vol. iv., p. 150, pl. ci.

The species belonging to this genus require, as regards their distribution in our district, more attention than they have yet received. The prevailing form, both littoral and pelagic, is undoubtedly that here noted. But other nearly related species, formerly confused with *A. longiremis* (Lilljeborg) will probably also be found. N.D.

ACARTIA LONGIREMIS (Lilljeborg).

1878. *Dias longiremis*, Brady (in part), loc. cit.

1892. *Acartia longiremis*, Giesbrecht (5), p. 522, pl. xxx., fig. 25, pl. xliii., fig. 25.

This is taken not unfrequently in the tow-net, though it appears to be by no means so abundant in our district as the preceding species. N.D.

SECTION II.—HARPACTICOIDA

The re-arrangement of this group adopted in Professor Sars' work on the "Crustacea of Norway" being not yet complete, the family divisions are here altogether omitted.

MISOPHRIA PALLIDA Boeck.

1864. *Misophria pallida*, Boeck, Oversigt af Norges Copepoder, p. 24.

1878. *Misophria pallida*, Brady (3), vol. i., p. 79, pl. xiii., figs. 11–16, pl. xviii., figs. 11, 12.

Dredged off Hawthorn in 27 fathoms on a sandy bottom (G. S. B.) D.

PTERINOPSYLLUS INSIGNIS G. S. Brady.

1878. *Lophophorus insignis*, Brady (3), vol. i., p. 122, pl. xiii., figs. 1–10, and pl. xv., fig. 10, and vol. iii., p. 23 *(Pterinopsyllus)*.

In the Ray Society Monograph (*loc. cit.*) this species was placed in the family Cyclopidæ. It is in fact intermediate in character between Cyclopidæ and Harpacticidæ, and Professor G. O. Sars has informed us (*in litt.*) that in his forthcoming work he will place the genus among Harpacticidæ. We think this right, and therefore adopt the new arrangement.

The type specimens were dredged in a depth of 27 fathoms off Hawthorn, Co. Durham. More recently it has been taken off Scarborough in 17 fathoms. D.

LONGIPEDIA CORONATA Claus.

1863. *Longipedia coronata*, Claus (2), p. 111, pl. xiv., figs. 14–24.

1903. *Longipedia coronata*, G. O. Sars (6), vol. v., p. 10, pls. iii. and iv.

The type species seems to be much less common in British waters than that recently described and named by Professor G. O. Sars, *L. Scotti*. *L. coronata*, however, was found in washings from dredged material taken off Northumberland and Durham in July, 1904, and off Hartlepool in 25 fathoms many years ago (G. S. B.) N.D.

LONGIPEDIA SCOTTI G. O. Sars.

1880. *Longipedia coronata*, Brady (3), vol. ii., p. 6, pls. xxxiv. and xxxv.

1903. *Longipedia Scotti*, G. O. Sars, An Account of the Crustacea of Norway, vol. v., p. 11, pl. v., fig. 1.
(not *Longipedia coronata*, Claus).

The true *Longipedia coronata* of Claus, described by that author in 1863 (Die frei-lebenden Copepoden, p. 111, pl. xiv., figs. 14–24) is said by Professor G. O. Sars to differ from that described and figured in the Ray Society Monograph of British Copepoda. The differences are found chiefly in the spinous armature of the last abdominal segments and second pair of feet.

L. Scotti is common in moderate depths of water, and on sandy bottoms especially is often very abundant. N.D.

ECTINOSOMA SARSII Boeck.

1872. *Ectinosoma Sarsii*, Boeck, Nye Slægter og Arter af Saltvands-Copepoder, p. 45.

1880. *Ectinosoma spinipes*, Brady (3), vol. ii., p. 9, pl. xxxvi., figs. 1–10.

Common in tidal pools and in moderate depths of water all round the coast. N.D.

ECTINOSOMA HERDMANI T. and A. Scott.

1896. *Ectinosoma Herdmani*, T. and A. Scott, A Revision of the British Copepoda belonging to the genera *Bradya*, Boeck, and *Ectinosoma*, Boeck. Trans. Linn. Soc., ser. 2, Zoology, vol. vi., p, 432, pl. xxxvi., figs. 16, 44, pl. xxxvii., figs. 3, 16, 29, 54, pl. xxxviii., figs. 7, 25, 33, 47.

Dredged off North Sunderland, September, 1902. N.

ECTINOSOMA NORMANI T. and A. Scott.

1896. *Ectinosoma Normani*, T. and A. Scott, A Revision of the British Copepoda belonging to the genera *Bradya*, Boeck, and *Ectinosoma*, Boeck. Trans. Linn. Soc., London, ser. 2, Zoology, vol. vi., p. 435, pl. xxxvi., figs. 21, 29, 39, pl. xxxvii., figs. 12, 26, 34, 51, pl. xxxviii., figs. 5, 18, 42, 45.

Found at the roots of Laminaria, Holy Island (G. S. B.) N.

ECTINOSOMA MELANICEPS Boeck.

1864. *Ectinosoma melaniceps*, Boeck, Oversigt af Norges Copepoder, p. 30.

1880. *Ectinosoma melaniceps*, Brady (3), vol. ii., p. 11, pl. xl., figs. 17–20.

A small species easily distinguished by a circumscribed patch of dusky grey colour on the front of the head. Generally distributed, but our only local records are "pools at extreme low-water mark, Roker," Cullercoats, and Alnmouth (G. S. B.) N.D.

ECTINOSOMA ERYTHROPS G. S. Brady.

1880. *Ectinosoma erythrops*, Brady (3), vol. ii., p. 12, pl. xxxvi., figs. 11–17.

"Dredged in depths of from five to thirty fathoms off the coasts of South Durham and North Yorkshire." This seems to be a rare species, but is recorded by Mr. T. Scott from the Firth of Forth, and by the late Mr. I. C. Thompson from the Irish Sea. D.

ECTINOSOMA BRUNNEA G. S. Brady.

1907. *Ectinosoma brunnea*, Brady, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne, new series, vol. i., p. 333, pl. ix., figs. 4–11.

Taken in a salt-water pond at Amble, December, 1905. N.

MICROSETELLA ROSEA (Dana).

1892. *Microsetella rosea*, Giesbrecht (5), pp. 550, 554, pl. xliv., figs. 32, 35, 37, 38, 41, 43, 46, 48, 49.

1905. *Microsetella rosea*, Brady, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new series, vol. i., p. 213, pl. iii., figs. 1–4.

One specimen only was found in washings from the dredge taken between St. Mary's Island and Souter Point. N.

BRADYA TYPICA Boeck.

1872. *Bradya typica*, Boeck, Nye Slægter og Arter af Saltvands-Copepoder, p. 47.

1880. *Bradya typica*, G. S. Brady (3), vol. ii., p. 17, pl. xxxviii., figs. 1–10.

1904. *Bradya typica*, G. O. Sars (6), vol. v., p. 46, pl. xxv.

This species is found generally on sandy bottoms similar to those haunted by *Longipedia*. Our only local record is "off Hartlepool in 25 fathoms" (G. S. B.) D.

PSEUDOBRADYA MINOR (T. and A. Scott).

1896. *Bradya minor*, T. and A. Scott, A Revision of the British Copepoda belonging to the genus *Bradya* Boeck and *Ectinosoma* Boeck, p. 425, pl. xxxv., figs. 5, 9, 13, 21, 24, 31, 35, 42, pl. xxxvi., figs. 5, 9.

1904. *Pseudobradya minor*, G. O. Sars (6), vol. v., p. 41, pl. xxii., fig. 2.

1907. *Bradya minor*, Brady, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne, new series, vol. i., p. 332, pl. ix., figs. 1–3.

Taken in a salt-water pond at Amble, December, 1905. This species may be at once recognised by a conspicuous dark patch near the base of the antennules. N.

ZOSIME TYPICA Boeck.

1872. *Zosime typica*, Boeck, Nye Slægter og Arter af Saltsvands-Copepoder, p. 46.

1880. *Zosime typica*, Brady (3), vol. ii., p. 15, pl. xxxix., figs. 1–12.

1903. *Zosime typica*, G. O. Sars (6), vol. v., p. 27, pl. xv.

Dredged twenty miles off Sunderland on a bottom of muddy sand in forty-five fathoms (G. S. B.) D.

CYLINDROPSYLLUS LÆVIS G. S. Brady.

1880. *Cylindropsyllus lævis*, Brady (3), vol. iii., p. 30, pl. lxxxiv., figs. 1–8.

1892. *Cylindropsyllus lævis*, T. Scott, Tenth Annual Report of the Fishery Board for Scotland, p. 258, pl. xiii., figs. 1–18.

This species was originally described and figured from a single female specimen taken off Hartlepool in a depth of five fathoms. We have seen no further specimens, but it has been taken in considerable numbers by Mr. T. Scott in the Firth of Forth, and has been fully described and figured by him (*loc. cit.*). The late Mr. I. C. Thompson, of Liverpool, also found it sparingly on the west coast of England. D.

HARPACTICUS CHELIFER (O. F. Müller).

1776. *Cyclops chelifer*, O. F. Müller, Zool. Dan. Prodr. 2413.

1850. *Arpacticus chelifer*, Baird, p. 212, pl. xxix., figs. 2, 3, 3a–g.

1880. *Harpacticus chelifer*, Brady (3), vol. ii., p. 146, pl. lxiv., figs. 19, 20, pl. lxv., figs. 1–7, 9, 11, 12, 14, 15.

1904. *Harpacticus chelifer*, G. O. Sars (6), vol. v., p. 49, pls. xxvii., xxviii.

One of the commonest of the Harpacticidæ: frequent between tidemarks—less frequent in greater depths. N.D.

HARPACTICUS FLEXUS Brady and Robertson.

1880. *Harpacticus flexus*, Brady (3), vol. ii., p. 152, pl. lxiv., figs. 12–18.

1904. *Harpacticus flexus*, Sars (6), vol. v., p. 53, pl. xxx., fig. 2.

On roots of Laminariæ, Holy Island (G. S. B.) N.

TIGRIOPUS FULVUS (S. Fischer).

1860. *Harpacticus fulvus*, S. Fischer, Beiträge zur Kenntniss der Entom. (Abhandl. der König. Bayer. Akad., vol. viii.), p. 656, pl. i., figs. 30–33, pl. ii., figs. 34–39.

1869. *Tigriopus Lilljeborgii*, Norman, Last Shetland Dredging Report, p. 296.

1880. *Harpacticus fulvus*, Brady (3), vol. ii., p. 149, pl. lxiv., figs. 1–11.

Found all round the coast, mostly in shallow pools at or above high-water mark, and often in vast swarms when the water has become warm with prolonged exposure to the sun. N.D.

ZAUS SPINATUS Goodsir.

1845. *Zaus spinatus*, Goodsir, Ann. and Mag. Nat. Hist., vol. xvi., p. 326, pl. xi., figs. 1–8.

1880. *Zaus spinatus*, Brady (3), vol. ii., p. 153, pl. lxvi., figs. 1–9.

1904. *Zaus spinatus*, G. O. Sars (6), vol. v., p. 57, pl. xxxiii.

Not uncommon among weeds, especially near low-water mark all along the coast. N.D.

ZAUS GOODSIRI G. S. Brady.

1880. *Zaus Goodsiri*, G. S. Brady (3), vol. ii., p. 156, pl. lxvi., figs. 10–13.

1904. *Zaus Goodsiri*, G. O. Sars (6), vol. v., p. 59, pl. xxxv.

Within our district we have seldom seen this species; it was dredged off Whitley in a depth of twenty fathoms, July, 1899, and one or two specimens were taken in the same year between tide-marks at Alnmouth (G. S. B.) N.

ALTEUTHA DEPRESSA Baird.

1850. *Alteutha depressa*, Baird (1), p. 216, pl. xxx., figs. 1, 2.

1868. *Alteutha typica*, Czerniawsky, Materialia ad Zoographiam ponticam comparatum, p. 34, pl. iii., figs. 15–25, pl. iv., fig. 10.

1880. *Peltidium crenulatum*, Brady (3), vol. ii., p. 163, pl. lxxii., figs. 6–15.

1889. *Alteutha depressa*, Claus, Copepodenstudien I. Peltidien, p. 11, pl. ii., figs. 9–17.

Dr. Baird (*loc. cit.*) records this species from "Berwick Bay, 1835, not common." Otherwise it does not appear to have been noticed in our district, and partly on this account we have heretofore taken Baird's species to be that here called *Eupelte purpurocincta*. But his description, and especially his figures, seem more properly applicable to the present species, and that view has also been taken by so good an authority as Professor Claus. N.

Alteutha interrupta (Goodsir).

1845. *Sterope interrupta* ♀ and *Carillus oblongus* ♂, Goodsir, Several new species of Crustacea allied to Saphirina. Ann. and Mag. Nat. Hist., vol. xvi., p. 326, pl. xi., figs. 10, 12.

1863. *Alteutha bopyroides*, Claus (2), p. 143, pl. xx., figs. 10–17.

1864. *Alteutha norvegica*, Boeck, Oversigt over de ved Norges Kyster iagttage Copepoder, p. 48.

1880. *Peltidium interruptum*, G. S. Brady (3), vol. ii., p. 162, pl. lxxi., figs. 4–15.

1885. *Peltidium conophorum*, Poppe, Frei-lebende Copepoden des Jadebusens, pl. vii., fig. 19.

1889. *Alteutha bopyroides*, Claus, Copepodenstudien I. Peltidien, p. 9, pl. i., figs. 1–11, pl. ii., figs. 1–8.

A common species taken mostly in the tow-net, also by the dredge, and less commonly between tide-marks. N.D.

Eupelte purpurocincta (Norman).

1869. *Alteutha purpurocincta*, Norman, "Last Report on Dredging off Shetland Isles." Brit. Assoc. Report, 1868, p. 298.

1880. *Peltidium depressum*, Brady (3), vol. ii., p. 160, pl. lxxii., figs. 1–5.

1889. *Eupelte purpurocincta*, Claus, Copepodenstudien I. Peltidien, p. 14, pl. iii., figs. 1–8.

This beautiful species is easily recognised by its flattened oval form and its transverse purple band; it is common in low-water pools, chiefly on the fronds of *Laminaria saccharina*. N.D.

ROBERTSONIA TENUIS (Brady and Robertson).

1876. *Ectinosoma tenue*, B. and R., Report Brit. Assoc., 1875, p. 196.

1880. *Robertsonia tenuis*, Brady (3), vol. ii., p. 25, pl. xli., figs. 1–14.

Dredged in several places off the Durham coast in depths of from twenty to thirty-seven fathoms (G. S. B.) D.

TEGASTES* FALCATUS Norman.

1869. *Amymone falcata*, Norman, "Last Report on Dredging off Shetland Isles." Brit. Assoc. Report, 1868, p. 296.

1872. *Amymone rubra*, Boeck, Nye Slægter og Arter af Saltvands-Copepoder, p. 49.

1880. *Amymone sphærica*, Brady (not Claus) (3), vol. ii., p. 28, pl. xlix., figs. 1–11.

1903. *Amymone rubra*, Brady, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-on-Tyne, new series, vol. i., p. 3, pl. i., fig. 13.

1904. *Tegastes falcatus*, Sars (6), p. 69, pl. xli.

A scarce but widely distributed species. Dredged in twenty-five fathoms off Marsden and Souter Point; found also at roots of Laminariæ at Holy Island (G. S. B.) N.D.

TEGASTES LONGIMANA (Claus).

1863. *Amymone longimana*, Claus (2), p. 115, pl. xx., figs. 13, 14.

1880. *Amymone longimana*, Brady (3), vol. ii., p. 30, pl. xlix., figs. 12, 13.

One specimen dredged in a depth of thirty-seven fathoms off Hawthorn (G. S. B.) D.

* The generic name *Amymone* having been twice previously used, by O. F. Müller in 1785 and by Savigny in 1817, Dr. Norman has proposed to substitute the term *Tegastes*.

PORCELLIDIUM FIMBRIATUM Claus.

1863. *Porcellidium fimbriatum*, Claus (2), p. 140. pl. xxii., fig. 1.

1880. *Porcellidium fimbriatum*, Brady (3), vol. ii., p. 167, pl. lxx., figs. 1–4.

1904. *Porcellidium fimbriatum*, G. O. Sars (6), vol. v., p. 76, pls. xliv., xlv.

Found chiefly on the fronds of Laminariæ between tide-marks, but "sometimes taken by the dredge in considerable numbers where decomposing algæ and other vegetable matters are deposited." In our district the only record is Alnmouth (G. S. B.) N.

ASPIDISCUS LITTORALIS G. O. Sars.

1904. *Aspidiscus littoralis*, G. O. Sars (6), vol. v., p. 79, pls. xlvi. and xlvii.

A beautiful species, easily recognized when well grown by a brilliant crimson patch occupying the centre of the body. Its favourite habitat, as in the case of many of the flattened or depressed Copepoda, is on the fronds of Laminariæ. Here it often occurs very abundantly at almost all points of our coast. In the "Monograph of British Copepoda" it was erroneously identified with *Aspidiscus fasciatus* Norman and *Porcellidium fasciatum* Boeck. Professor Sars, however, has shown that it differs from both these species, and has proposed for it the specific name *littoralis*.

PSAMATHE LONGICAUDA Philippi.

1840. *Psamathe longicauda*, Philippi, Weigman. Archiv für Naturgesch., p. 189, pl. iv., fig. 1.

1880. *Scutellidium tisboides*, Brady (3), vol. ii., p. 175, pl. lxviii., figs. 1–10.

1905. *Psamathe longicauda*, G. O. Sars (6), vol. 5, p. 83, pl. xlix.

This has many characters in common with *Tisbe furcata*, and is met with in similar situations, but always sparingly. We have seen no local specimens excepting one or two taken at Roker on the fronds of *Laminaria saccharina* (G. S. B.) D.

TISBE FURCATA (Baird).

1850. *Canthocamptus furcatus*, Baird (1), p. 210, pl. xxv., figs. 1, 2, pl. xxx., figs. 4–6.

1880. *Idya furcata*, Brady (3), vol. ii., p. 172, pl. lxvii., figs. 1–11.

1906. *Tisbe furcata*, Norman and Scott (7). p. 183.

A very common species in tidal pools : much less frequent in the open sea. Very widely distributed, and correspondingly variable in minor characteristics. N.D.

THALESTRIS LONGIMANA Claus.

1863. *Thalestris longimana*, Claus (2), p. 130, pl. xviii., figs. 1–11.

1880. *Thalestris longimana*, Brady (3), vol. ii., p. 136, pl. lx., figs. 1–13.

A very conspicuous species owing to its generally beautiful coloration, but never occurring in any great abundance. Not uncommon between tidemarks all along the coast. N.D.

THALESTRIS BRUNNEA G. O. Sars.

1905. *Thalestris brunnea*, G. O. Sars (6), vol. v., p. 108, pl. lxiii.

Specimens taken at Roker on the roots of Laminariæ, and doubtfully referred by Dr. Brady to *T. rufo-violascens* Claus, are considered by Professor Sars to belong to a species newly described by him under the specific name *brunnea*. D.

PARATHALESTRIS CLAUSI (Norman).

1905. *Parathalestris Clausi*, G. O. Sars (6), vol. v., p. 111, pls. lxv., lxvi.

Syn. : *Thalestris Clausi*, Brady and Norman.

This is one of the commonest of British Harpacticidæ, being often found plentifully in pools of the littoral zone, as well as in the open sea. N.D.

PARATHALESTRIS HIBERNICA (Brady and Robertson).

1873. *Thalestris hibernica*, B. and R., Ann. and Mag. Nat. Hist., ser. 4, vol. xii., p. 135, pl. viii., figs. 17–19.

1880. *Thalestris hibernica*, Brady (3), vol. ii., p. 134, pl. lxii., figs. 13–17, pl. lxiii., figs. 14, 15.

1905. *Parathalestris hibernica*, G. O. Sars (6), vol. v., p. 113, pl. lxviii.

A scarce species. Our only local record is Holy Island, where it was found at the roots of Laminariæ. N.

PARATHALESTRIS (?) NORTHUMBRICA *nov. nom.*

1905. *Thalestris robusta*, Brady, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new series, vol. i., p. 218, pl. v., figs. 11–17 (not *Th. robusta* Claus).

One specimen found in a tidal pool at Cullercoats (G. S. B.) N.

PARATHALESTRIS (?) DENTI (G. S. Brady).

1905. *Thalestris Denti*, Brady, *loc. cit.*, p. 218, pl. vi., figs. 10–15.

Found in washings of dredged material taken between St. Mary's Island and Souter Point, July, 1904 (G. S. B.) N.D.

Of this and the preceding species the male only has been seen, and the generic reference must be considered as provisional merely.

PARATHALESTRIS HARPACTOIDES (Claus).

1880. *Thalestris harpactoides*, Brady (3), vol. ii., p. 127, pl. l., figs. 9–16, pl. lix., fig. 1.

1905. *Parathalestris harpactoides*, G. O. Sars (6), vol. v., p. 112, pl. lxvii.

This species occurred in a surface-net gathering from Teesmouth given to us by the late Mr. E. C. Davison of Sunderland (G. S. B.); rock pools, Seaton Sluice, Northumberland (A. M. N.) N.D.

PHYLLOTHALESTRIS MYSIS (Claus).

1880. *Thalestris mysis*, Brady (3), vol. ii., p. 121, pl. lviii., figs. 1–13.

1905. *Phyllothalestris mysis*, G. O. Sars (6), vol. v., p. 116, pls. lxx., lxxi.

In tidal pools among algæ, Alnmouth (G. S. B.)

Easily recognized by the abnormally large and foliaceous fifth pair of feet in the female. N.

RHYNCHOTHALESTRIS RUFOCINCTA (Norman).

1880. *Thalestris rufocincta*, Brady (3), vol. ii., p. 125, pl. lvii., figs. 1–9.

1905. *Rhynchothalestris rufocincta*, G. O. Sars (6), vol. v., p. 120, pls. lxxiii., lxxiv.

Dredged off Marsden, 10 fathoms, and off Hawthorn, 27 fathoms, and at low-water on fronds of Laminariæ at Roker (G. S. B.) D.

RHYNCHOTHALESTRIS HELGOLANDICA (Claus).

1880. *Thalestris helgolandica*, Brady (3), vol. ii., p. 123, pl. lxi., figs. 9–14.

1905. *Rhynchothalestris helgolandica*, G. O. Sars (6), vol. v., p. 121, pl. lxxv.

Dredged off the Durham coast in 27 fathoms (G. S. B.) D.

MICROTHALESTRIS FORFICULA (Claus).

1863. *Thalestris forficula*, Claus (2), p. 131, pl. xvii., figs. 7–11.

1894. *Thalestris forficuloides*, T. and A. Scott, Twelfth Annual Report of the Fishery Board for Scotland, p. 255, pl. x., figs. 13–25, and On Some New and Rare Crustacea from Scotland (Annals and Magazine of Natural History, ser. vi., vol. xii., 1894).

1905. *Microthalestris forficula*, G. O. Sars (6), vol. v., p. 123, pl. lxxvi.

Found at the roots of Laminariæ, Holy Island (G. S. B.) N.

The foregoing genera *Parathalestris*, *Phyllothalestris*, *Rhynchothalestris*, and *Microthalestris*, previously referred by most authors to *Thalestris* Claus, are considered by Dr. G. O. Sars to belong to distinct genera to which he has assigned the names here used.

DACTYLOPUSIA TISBOIDES (Claus).

1880. *Dactylopus tisboides*, Brady (3), vol. ii., p. 106, pl. liv., figs. 1–13.

1905. *Dactylopusia thisboides*, G. O. Sars (6), vol. v., p. 126, pls. lxxvii. and lxxviii., fig. 1.

One of the commonest of the Harpacticidæ, occurring abundantly between tidemarks, and less profusely in greater depths of water down to at least 40 fathoms. N.D.

Dactylopusia neglecta G. O. Sars.

1880. *Dactylopus tisboides*, Brady (3) (brackish water variety), vol. ii., p. 108, pl. liv., figs. 14–16.

1905. *Dactylopusia neglecta*, G. O. Sars (6), vol. v., p. 127, pl. lxxviii., fig. 2.

This was briefly noticed and figured in the "Monograph of British Copepoda" as a brackish water variety of *D. tisboides*, but the characters are distinctive enough to have warranted Professor G. O Sars in giving it specific rank. The only local record is "brackish pools at Seaton Sluice, Northumberland" (G. S. B.) N.

Dactylopusia brevicornis (Claus).

1880. *Dactylopus brevicornis*, Brady (3), vol. ii., p. 118, pl. lvii., figs. 10–12, pl. lviii., fig. 14.

1905. *Dactylopusia brevicornis*, G. O. Sars (6), vol. v., p. 130, pl. lxxx.

Not uncommon on the fronds of *Laminaria saccharina* at Sunderland (G. S. B.) D.

Dactylopusia platycheles (G. S. Brady).

1902. *Dactylopus platycheles*, Brady, On Copepoda and other Crustacea taken in Ireland and on the North-East Coast of England. Nat. Hist. Trans. Northumberland and Durham, vol. xiv., p. 61, pl. iii., figs. 1–10.

Taken among algæ at extreme low-water mark, Roker (G. S. B.) D.

Dactylopusia longirostris (Claus).

1863. *Dactylopus longirostris*, Claus (2), p. 127, pl. xvii., figs. 4–6.

1899. *Dactylopus longirostris*, Brady, On *Ilyopsyllus coriaceus* and other Crustacea taken at Alnmouth. Nat. Hist. Trans. Northumberland and Durham, vol. xiii., p. 434, pl. xiii., figs. 9-12.

One specimen which we take to belong to this species was got in a pool near low-water mark at Alnmouth (G. S. B.) N.

DACTYLOPUSIA VULGARIS G. O. Sars.

1880. *Dactylopus Stromii*, Brady (3), vol. ii., p. 111, pl. lv., figs. 1–13.

1905. *Dactylopusia vulgaris*, G. O. Sars (6), vol. v., p. 128, pl. lxxiv., fig. 1.

"Roker, on *Laminaria saccharina*, rare" (G. S. B.) D.

AMENOPHIA PELTATA Boeck.

1864. *Amenophia peltata*, Boeck, Oversigt Norges Copepoder, p. 45 (separate copy).

1880. *Thalestris peltata*, Brady (3), vol. ii., p. 138, pl. liii. figs. 11–15.

1906. *Amenophia peltata*, G. O. Sars (6), vol. v., p. 136, pls. lxxxiii. and lxxxiv., fig. 1.

One specimen found in a tidal pool at low-water mark, Alnmouth (G. S. B.) N.

DACTYLOPODELLA FLAVA (Claus).

1866. *Dactylopus flavus*, Claus, Die Copepoden-Fauna von Nizza, p. 28, pl. iii., figs. 13–16.

1880. *Dactylopus flavus* (partim), Brady (3), vol. ii., p. 116, pl. lvi., figs. 1–11.

1905. *Dactylopodella flava*, G. O. Sars (6), vol. v., p. 132, pl. lxxxi.

The specimens referred in the "Monograph of British Copepoda" to *Dactylopus flavus* Claus belonged to two distinct species—*D. flavus* Claus and *Idomene forficata* Philippi. No specimens from Northumberland or Durham having been preserved, it is impossible now to say with certainty which of the two species ought to be recorded in this list, but inasmuch as those taken off Red Cliff, Yorkshire, belong undoubtedly to *D. flavus*, it seems fair to assume that the Durham specimens dredged off Hawthorn are also referable to that species. D.

WESTWOODIA NOBILIS (Baird).

1845. *Arpacticus nobilis*, Baird, Trans. Berw. Nat. Club, vol. ii., p. 155.

1888. *Westwoodia nobilis*, Brady (3), vol. ii., p. 141, pl. lxiii., figs. 1–13.

Recorded by Dr. Baird from Berwick Bay. Very rarely on fronds of Laminaria at Sunderland (G. S. B.) A widely distributed species, but never occurring in great numbers. N.D.

Diosaccus tenuicornis (Claus).

1863. *Dactylopus tenuicornis*, Claus (2), p. 127, pl. xvi., figs. 17–23.

1880. *Diosaccus tenuicornis*, Brady (3), vol. ii., p. 68, pl. lix., figs. 12–16, pl. lx., figs. 14–18.

Widely distributed; living chiefly on the fronds of Laminaria. The only local record is Cullercoats (G. S. B.) N.

Amphiascus imus (G. S. Brady).

1872. *Stenhelia ima*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iv., p. 436, pl. xix., figs. 1–5.

1880. *Stenhelia ima*, Brady (3), vol. ii., p. 35, pl. xliii., figs. 1–14.

1906. *Amphiascus imus*, G. O. Sars (6), vol. v., p. 156, pl. xcvii.

Dredged off the Durham coast near Marsden and off Hartlepool (G. S. B.) D.

Amphiascus tenuiremis (G. S. Brady).

1880. *Dactylopus tenuiremis*, Brady (3), vol. ii., p. 115, pl. lvi., figs. 12–18.

1906. *Amphiascus tenuiremis*, G. O. Sars (6), vol. v., p. 161, pl. cii.

Dredged in 45 fathoms 20 miles off Sunderland, and in 30 to 39 fathoms off Souter Point (G. S. B.) D.

Amphiascus hispidus (Brady).

1880. *Stenhelia hispida*, Brady (3), vol. ii., p. 32, pl. xlii., figs. 1–14.

1906. *Amphiascus hispidus*, G. O. Sars (6), vol. v., p. 166, pls. cvii., cviii.

Dredged off Hartlepool in five fathoms, and off Marsden, 30 fathoms (G. S. B.) D.

AMPHIASCUS INTERMEDIUS (Scott).

1897. *Stenhelia intermedia*, Scott, Marine Invertebrata of Loch Fyne. 15th Annual Report Fishery Board for Scotland, p. 169, pl. ii., figs. 10-21.

1906. *Amphiascus intermedius*, G. O. Sars (6), vol. v., p. 169, pl. cx.

A single specimen found among dredged material from a depth of 25 fathoms off Hartlepool (G. S. B.) D.

DELAVALIA PALUSTRIS G. S. Brady.

1868. *Delavalia palustris*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 134, pl. v., figs. 10–15, and (3) vol. ii., p. 43, pl. l., figs. 1–8.

1906. *Stenhelia palustris*, G. O. Sars (6), vol. v., p, 185, pl. cxxii.

Found in brackish pools near the mouth of the Seaton Burn, Northumberland, and in similar pools on the Aln above Alnmouth (G. S. B.)

Professor G. O. Sars considers *(loc. cit.)* that the genus *Delavalia* is really identical with *Stenhelia* Boeck, but Boeck's definition of *Stenhelia* assigns to the first pair of feet a structure "similar to those of Dactylopus," and of this latter genus he says of the first pair of feet that "the inner branch is elongated, three-jointed, the first joint being very long and bearing two prehensile bristles: the inner branch generally smaller, with its middle joint not much longer than the other two"—both branches being therefore three-jointed. But one of the most distinctive characters of *Delavalia* is the *two-jointed* and *non-prehensile* inner branch of the first foot. We therefore prefer to retain that generic name. N.

DELAVALIA LONGICAUDATA (Boeck).

1872. *Stenhelia longicaudata*, Boeck, Nye Slægter og Arter af Saltvands-Copepoder. Chr. Vid. Forh., p. 49.

1880. *Delavalia reflexa*, Brady (partim) (3), vol. ii., p. 45, pl. li., figs. 9, 14.

1906. *Stenhelia longicaudata*, G. O. Sars (6), vol. v., p. 190, pl. cxxv., fig. 1.

This species is included in our list on the faith of Professor G. O. Sars, who remarks that "some of the figures given by

Professor Brady of his species *Delavalia reflexa* (for instance figures 9 and 14) undoubtedly refer to the present form." *D. reflexa* was dredged on a sandy bottom five miles off Hartlepool (G. S. B.) D.

Delavalia reflexa Brady and Robertson.

1875. *Delavalia reflexa*, B. and R., Brit. Assoc. Report, p. 196.

1880. *Delavalia reflexa*, Brady (3), vol. ii., p. 45, pl. li., figs. 1–8, 11–13.

1906. *Stenhelia reflexa*, G. O. Sars (6), vol. v., p. 186, pl. cxxiii.

Respecting this species G. O. Sars says, "It seems to me beyond doubt that Mr. Brady, under the name of *Delavalia reflexa*, has confounded two distinct species," and that some of his figures refer to *Stenhelia longicaudata*, the remainder only to *S. reflexa*.

Found off Hartlepool as noted under *D. longicaudata*. D.

Delavalia robusta Brady and Robertson.

1875. *Delavalia robusta*, B. and R., Brit. Assoc. Report, p. 196.

1880. *Delavalia robusta*, Brady (3), vol. ii., p. 46, pl. li., figs. 15–21.

Dredged off Hawthorn (G. S. B.) D.

Delavalia pygmæa Brady.

1905. *Delavalia pygmæa*, Brady, On Copepoda and other Crustacea taken off Northumberland and Durham in July, 1904. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new series, vol. i., p. 214, pl. iii., figs. 5–10.

One specimen taken between St. Mary's Island and Souter Point in washings from dredge (G. S. B.) N.

Stenhelia limicola G. S. Brady.

1899. *Stenhelia limicola*, Brady, On *Ilyopsyllus coriaceus* and other Crustacea taken at Alnmouth. Nat. Hist. Trans. Northumberland and Durham, vol. xiii., p. 433, pl. xii., figs. 1–7.

Two or three examples of this species were taken near the old oyster-hatchery at the side of the Aln above Alnmouth; we had previously found it in a somewhat similar situation on the muddy shores of the river Glen at Carrick, County Donegal (G. S. B.) N.

STENHELIA MEEKI G. S. Brady.

1905. *Stenhelia Meeki*, Brady, On Copepoda and other Crustacea taken off Northumberland and Durham in July, 1904. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new series, vol. i., p. 216, pl. iv., figs. 7–16.

One specimen found in washings from dredge between St. Mary's Island and Souter Point (G. S. B.) N.

STENHELIA HERDMANI A. Scott.

1896. *Stenhelia Herdmani*, A. Scott, Some New and Rare Copepoda from Liverpool Bay. Report for 1895 on the Lancashire Sea Fisheries Laboratory, pl. i., figs. 1–11.

1903. Brady, on Entomostraca found at the roots of *Laminariæ*. Nat. Hist. Trans. Northumberland and Durham, new series, vol. i., p. 3, pl. i., figs. 1–11.

Found in washings from the roots of Laminaria at Holy Island (G. S. B.) N.

STENHELIA DENTICULATA I. C. Thompson.

1893. *Stenhelia denticulata*, Thompson, Revised Report on the Copepoda of Liverpool Bay. Trans. Liverpool Biological Society, p. 20, pl. xxx., figs. 1–11.

1903. *Stenhelia denticulata*, Brady, On Entomostraca found at the roots of *Laminariæ*. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, vol. i., new series, p. 3.

Dredged off Whitley in a depth of twenty fathoms (G. S. B.) N.

STENHELIA ÆMULA (T. Scott).

1893. *Delavalia æmula*, T. Scott, Additions to the Fauna of the Firth of Forth. Eleventh Annual Report Fishery Board for Scotland, p. 204, pl. iv., figs. 36–47.

1906. *Stenhelia æmula*, G. O. Sars (6), vol. v., p. 184, pl. cxxi.

Taken in a depth of 25 fathoms five miles off Hartlepool (G. S. B.) D.

CANTHOCAMPTUS MINUTUS (O. F. Müller).

1776. *Cyclops minutus*, O. F. Müller, Zool. Dan. Prodr., 2400.

1785. *Cyclops minutus*, idem, Entomostraca, p. 101, pl. xvii., figs. 1–7.

1820. *Monoculus staphylinus*, Jurine, Hist. des Monocles, p. 74, pl. vii., figs. 1–19.

1880. *Canthocamptus minutus*, Brady (3), vol. ii., p. 48, pl. xliv., figs. 1–17.

A very widely distributed and common species, occurring abundantly in most sheets of fresh water whether great or small. N.D.

CANTHOCAMPTUS HORRIDUS Fischer.

1860. *Canthocamptus horridus*, Fischer, Beiträge zur Kenntniss der Entomostraceen. Abhandl. der König. Bayer. Akad. der Wissensch., vol. viii., p. 670, pl. xxi., figs. 57–59a, 60.

1880. *Canthocamptus northumbricus*, Brady (3), vol. ii., p. 57, pl. xlv., figs. 1–14.

This has been identified by Professor Lilljeborg, we think rightly, with the more recently described *C. northumbricus*: the earlier name must, of course, be adopted. It was found sparingly in Bolam Lake, Northumberland, and more lately (July, 1896) in Loughrigg Tarn (G. S. B.) Noticed also by Mr. T. Scott near Edinburgh, and by Mr. Scourfield in the South of England. N.

ATTHEYELLA CRASSA (G. O. Sars).

1863. *Canthocamptus crassus*, G. O. Sars, Oversigt af de indenlandske Ferskvandscopepoder, p. 23 (separate copy).

1880. *Attheyella spinosa*, Brady (3), vol. ii., p. 58, pl. xliii., figs. 15–18, pl. xlvi., figs. 13–18.

1907. *Attheyella crassa*, G. O. Sars (6), vol. v., p. 199, pl. cxxix.

A small species, probably not uncommon, but easily overlooked. The only localities in our district of which we have notes are an engine-pond at Murton Junction, near Sunderland, and a "ferruginous ditch at the roadside half-way between Haydon Bridge and Stawarď" (G. S. B.) N.D.

ATTHEYELLA PYGMÆA (G. O. Sars).

1863. *Canthocamptus pygmæus*, G. O. Sars, *loc. cit.*, p. 21.

1880. *Attheyella cryptorum*, Brady (3), vol. ii., p. 60, pl. lii., figs. 1–18.

1907. *Attheyella pygmæa*, G. O. Sars (6), vol. v., p. 202, pl. cxxxi.

A commoner species apparently than the preceding, and widely distributed, preferring pools and ditches rather than large expanses of water. Our only local record is, however, from a very different situation—"the damp roof of the pit workings of the low main, West Cramlington Colliery, living among films of gelatinous algæ." These specimens were sent to us by the late Mr. Atthey, and the genus was named after him, but the species—thought at the time to be new—had been previously described by G. O. Sars as a *Canthocamptus*. We still think, however, that the characters are such as to warrant a generic distinction. N.D.

MESOCHRA LILLJEBORGI Boeck.

1864. *Mesochra Lilljeborgi*, Boeck, Oversigt af Norges Copepoder, p. 51.

1880. *Mesochra Lilljeborgi*, Brady (3), vol. ii., p. 62, pl. xli., figs. 15–21, pl. xlvii., figs. 16–21.

In the north-eastern district this species seems to be confined to brackish water localities, having been found only in salt-marsh pools at Seaton Sluice and Alnmouth (G. S. B.) N.

TACHIDIUS DISCIPES Giesbrecht.

1869. *Tachidius brevicornis*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 130, pl. v., figs. 1–9.

1880. *Tachidius brevicornis*, Brady (3), vol. ii., p. 20, pl. xxxvii.

1881. *Tachidius discipes*, Giesbrecht, Die freilebenden Copepoden der Kieler Foehrde, p. 108.

The reference of this species to *Cyclops brevicornis* Müller—until recently adopted by most authors—was, to say the least, a very doubtful one. It seems best, therefore, to use the new specific name proposed by Giesbrecht.

T. discipes is to be found plentifully during the summer months in the brackish pools of almost all estuaries and salt-marshes. N.D.

Tachidius littoralis Poppe.

1881. *Tachidius littoralis*, Poppe, Ueber einen neuen Harpacticiden. Abhandl. d. naturw. Ver. Bremen, vol. vii., p. 149, pl. vi.

1892. *Tachidius crassicornis*, T. Scott, Additions to the Fauna of the Firth of Forth, Part 4. Tenth Annual Report of Fishery Board for Scotland, p. 250, pl. viii., figs. 14–27.

1895. *Tachidius littoralis*, Brady, Entomostraca collected in the Solway district and at Seaton Sluice. Nat. Hist. Trans. Northumberland and Durham, vol. xiii., p. 13, pl. ii., figs. 14–17.

Another brackish water species found in similar situations to the foregoing. River Lyne at Newbiggin, mouth of the Wansbeck, and Seaton Carew (A. M. N.); Seaton Sluice (G. S. B.) N.D.

Ameiropsis brevicornis G. O. Sars.

1880. *Ameira longipes*, Brady (3), vol. ii., p. 37, pl. liii., figs. 1–10.

1907. *Ameiropsis brevicornis*, G. O. Sars (6), vol. v., p. 224, pl. cxlviii.

Dredged in 25 to 45 fathoms off the Durham coast (G. S. B.)

Professor G. O. Sars considers that the species called by us *Ameira longipes* belongs to a nearly allied distinct genus named by him as above, and distinguished chiefly by the structure of the mandibular palp. D.

AMEIRA BREVIREMIS G. S. Brady.

1905. *Ameira breviremis*, Brady, On Copepoda and other Crustacea taken off Northumberland and Durham in July, 1904. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new series, vol. i., p. 214, pl. iii., figs. 11–14, and pl. iv., figs. 1–6.

One specimen only taken between St. Mary's Island and Souter Point in washings from dredged material (G. S. B.) N.

DANIELSSENIA TYPICA Boeck.

1872. *Danielssenia typica*, Boeck, Nye Slægter og Arter Saltvands-Copepoder, p. 55.

1880. *Jonesiella spinulosa*, Brady (3), vol. ii., p. 41, pl. xlviii., figs. 14–18, pl. xlix., figs. 14, 15.

Taken sparingly off Hartlepool on a sandy bottom, and off Hawthorn on a muddy bottom, depth 37 fathoms (G. S. B.) D.

THOMPSONULA HYÆNÆ (I. C. Thompson).

1889. *Jonesiella hyænæ*, I. C. Thompson, Proc. Liverpool Biological Society, vol. iii., p. 193, pl. ix., figs. 1–10.

1905. *Thompsonula hyænæ*, T. Scott, Ann. and Mag. Nat. Hist., ser. 7, vol. xvi., p. 571.

A few specimens of this interesting species were taken by the dredge off North Sunderland in 1892 (G. S. B.). It has been dredged also by Dr. Scott in the Firth of Forth. N.

PHYLLOPODOPSYLLUS BRADYI (T. Scott).

1892. *Tetragoniceps Bradyi*, T. Scott, Tenth Annual Report of the Fishery Board for Scotland, p. 253, pl. ix., figs. 19–32.

1905. *Tetragoniceps Bradyi*, Brady, On Copepoda and other Crustacea taken off Northumberland and Durham in July, 1904. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new series, vol. i., p. 217, pl. v., figs. 1–10.

1907. *Phyllopodopsyllus Bradyi*, G. O. Sars (6), vol. v., p. 231, pl. clv.

One specimen found in washings from dredge between St. Mary's Island and Souter Point (G. S. B.) N.

STENOCOPIA LONGICAUDATA (T. Scott).

1892. *Ameira longicaudata*, T. Scott, Additions to the Fauna of the Firth of Forth. 10th Annual Report of the Fishery Board for Scotland, Part 3, p. 250, pl. ix., figs. 1–18.

1907. *Stenocopia longicaudata*, Sars (6), vol. v., p. 228, pls. cli., clii.

Dredged off Hartlepool in 25 fathoms (G. S. B.) D.

LAOPHONTE CORNUTA Philippi.

1840. *Laophonte cornuta*, Philippi, Archiv für Naturgeschichte, p. 189, pl. iii., fig. 13.

1880. *Laophonte serrata*, Brady (3), vol. ii., p. 71, pl. lxxiii., figs. 1–14.

1907. *Laophonte cornuta*, G. O. Sars (6), vol. v., p. 235, pls. clvii. and clviii.

In the opinion of Professor G. O. Sars this species "has been erroneously identified by Brady and other British authors with *Cleta serrata* of Claus, which is a different species."

Found at the roots of Laminariæ at Holy Island. N.

LAOPHONTE CURTICAUDA Boeck.

1864. *Laophonte curticauda*, Boeck, Oversigt af Norges Copepoder, p. 54.

1880. *Laophonte curticauda*, Brady (3), vol. ii., p. 80, pl. lxxiii., figs. 15–18, pl. lxxvi., figs. 1–9.

A common littoral species, found in tidal pools at Whitburn and Sunderland, and at the roots of Laminariæ, Holy Island (G. S. B.) N.D.

LAOPHONTE SIMILIS (Claus).

1866. *Cleta similis*, Claus, Die Copepodenfauna von Nizza, p. 23, pl. v., figs. 13, 14.

1880. *Laophonte similis*, Brady (3), vol. ii., p. 78, pl. lxxv., figs. 1–14.

A common form in the littoral zone, and extending downwards to a depth of several fathoms along the coasts of Durham and Northumberland. N.D.

LAOPHONTE LONGICAUDATA Boeck.

1864. *Laophonte longicaudata*, Boeck, Oversigt af Norges Copepoder, p. 55.

1880. *Laophonte longicaudata*, Brady (3), vol. ii., p. 82, pl. lxxiv., figs. 12–15, pl. lxxvi., figs. 10–15.

Dredged in several places off the Durham coast down to 30 fathoms—Hartlepool, Seaham, and Hawthorn (G. S. B.) D.

LAOPHONTOPSIS LAMELLIFERA (Claus).

1863. *Cleta lamellifera*, Claus (2), p. 123, pl. xv., figs. 21–25.

1880. *Laophonte lamellifera*, Brady (3), vol. ii., p. 83, pl. lxxv., figs. 15–23.

A rather scarce species, but occurring both on algæ in the littoral zone and among dredged material from moderate depths. On Laminariæ and on muddy rocks, Sunderland, and at the roots of Laminariæ, Sunderland and Holy Island (G. S. B.) N.D.

ASELLOPSIS HISPIDA Brady and Robertson.

1873. *Asellopsis hispida*, B. and R., Ann. and Mag. Nat. Hist., ser. 4, vol. xii., p. 137, pl. ix., figs. 6–10.

1880. *Laophonte hispida*, Brady (3), vol. ii., p. 85, pl. lxxxi., figs. 1–11.

Dredged sparingly in a depth of from four to ten fathoms off the Durham coast (G. S. B.) D.

NORMANELLA DUBIA (Brady and Robertson).

1876. *Laophonte dubia*, B. and R., Brit. Assoc. Report (1875), p. 196.

1880. *Normanella dubia*, Brady (3), vol. ii., p. 87, pl. lxxviii., figs. 12–22.

A minute species, probably often overlooked, though widely distributed. Dredged off Marsden and Hartlepool, 10 to 30 fathoms (G. S. B.) D.

CLETODES LIMICOLA G. S. Brady.

1872. *Cletodes limicola*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iv., p. 438, pl. xxi., figs. 10–17.

1880. *Cletodes limicola*, Brady (3), vol. ii., p. 90, pl. lxxix., figs. 1–12.

In depths of from 20 to 45 fathoms in muddy sand off the Durham coast (G. S. B.) D.

Cletodes longicaudata Brady and Robertson.

1876. *Cletodes longicaudata*, B. and R., Brit. Assoc. Report (1875), p. 196.

1880. *Cletodes longicaudata*, Brady (3), vol. ii., p. 92, pl. lxxix., figs. 13–19.

Found in similar situations to the preceding species. Off Hartlepool five fathoms, and at roots of Laminaria, Holy Island (G. S. B.) N.D.

Cletodes propinqua Brady and Robertson.

1876. *Cletodes propinqua*, B. and R., Brit. Assoc. Report (1875), p. 196.

1880. *Cletodes propinqua*, Brady (3), vol. ii., p. 94, pl. lxxvii., figs. 9–17.

Dredged off Marsden in 35 fathoms (G. S. B.) D.

Cletodes linearis (Claus).

1866. *Lilljeborgia linearis*, Claus, Die Copepodenfauna von Nizza, p. 22, pl. ii., figs. 1–8.

1880. *Cletodes linearis*, Brady (3), vol. ii., p. 95, pl. lxxx., figs. 1–14.

An uncommon species. The only local record is Holy Island, where it was found at the roots of Laminaria (G. S. B.) N.

Cletodes similis T. Scott.

1895. *Cletodes similis*, T. Scott, Thirteenth Annual Report of the Fishery Board for Scotland, p. 168, pl. iii., figs. 22–26, pl. iv., figs. 1–3.

At roots of Laminariæ, Holy Island, and dredged off Souter Point in 39 fathoms (G. S. B.) N.D.

Cletodes lata T. Scott.

1892. *Cletodes lata*, T. Scott, Tenth Annual Report Fishery Board for Scotland, p. 257, pl. x., figs. 10–18.

Dredged off Hartlepool in 25 fathoms (G. S. B.) D.

PONTOPOLITES TYPICUS T. Scott.

1894. *Pontopolites typicus*, T. Scott, Twelfth Annual Report of the Fishery Board for Scotland, p. 251, pl. viii., figs. 9–17.

1903. *Pontopolites typicus*, Brady, On Entomostraca found at the roots of Laminariæ. Trans. Nat. Hist. Soc. Northumberland and Durham, new series, vol. i., p. 4, pl. i., figs. 4–12.

Found at the roots of Laminariæ, Holy Island (G. S. B.) N.

NANNOPUS PALUSTRIS G. S. Brady.

1880. *Nannopus palustris*, Brady (3), vol. ii., p. 101, pl. lxxvii., figs. 18–20.

A few specimens found in pools of brackish water at Seaton Sluice (G. S. B.) N.

PLATYCHELIPUS LITTORALIS G. S. Brady.

1880. *Platychelipus littoralis*, Brady (3), vol. ii., p. 103, pl. lxxix., figs. 20–23, pl. lxxx., figs. 15-19.

In brackish pools at Alnmouth and Seaton Sluice (G. S. B.) N.

ILYOPSYLLUS CORIACEUS Brady and Robertson.

1880. *Ilyopsyllus coriaceus*, Brady (3), vol. ii., p. 143, pl. lxxxii., figs. 1–10.

1899. *Ilyopsyllus coriaceus*, Brady, On *Ilyopsyllus coriaceus* and other Crustacea taken at Alnmouth. Nat. Hist. Trans. Northumberland and Durham, vol. xiii., p. 434, pls. xi. and xii., fig. 8.

This very curious and interesting species was first described from specimens taken in the West of Ireland. It has since been found at Arcachon in France, at Lymington in Hampshire, and lastly on the muddy flats at Alnmouth, Northumberland. In all these cases the habitat has been similar—on mud banks a little removed from the sea where the salinity of the water is periodically reduced by admixture from rivers. N.

Section III.—CYCLOPOIDA

Fam. 1.—CYCLOPIDÆ

Oithona similis Claus.

1866. *Oithona similis*, Claus, Die Copepoden-Fauna von Nizza, p. 14.

1878. *Oithona spinifrons* (Boeck?), Brady (3), vol. i., p. 90, pl. xiv., figs. 1–9, pl. xxiv.A, figs. 1, 2.

Taken frequently by the tow-net in the open sea, but seldom in any great numbers. N.D.

Cyclopina littoralis G. S. Brady.

1872. *Cyclopina littoralis*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iv., p. 429, pl. xvii., figs. 9–14.

1878. *Cyclopina littoralis*, Brady (3), vol. i., p. 92, pl. xv., figs. 1–9.

This is a rather rare species, occurring chiefly among weeds between tidemarks, but also in dredgings from various depths up to 45 fathoms. We have taken it in tidal pools at Alnmouth, Whitley, and Ryhope, as well as in several dredgings off the coast (G. S. B.) N.D.

Cyclopina gracilis Claus.

1863. *Cyclopina gracilis*, Claus (2), p. 104, pl. x., figs. 9–15.

1878. *Cyclopina gracilis*, Brady (3), vol. i., p. 93, pl. xxiv.B, figs. 1–9, pl. xci., figs. 10, 11.

1906. *Cyclopina gracilis*, Brady, Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne, new series, vol. i., part 3, pl. x., fig. 13.

Several specimens of *C. gracilis* were found in a gathering from a salt-water pond at Amble in December, 1905. N.

Cyclopina (?) ovalis G. S. Brady.

1880. *Cyclopina (?) ovalis*, Brady (3), vol. ii., p. 181 (woodcut).

To the original description based upon a single imperfect specimen we are able to add nothing. It was taken in the surface net off Sunderland (G. S. B.) D.

EURYTE LONGICAUDA Philippi.

1843. *Euryte longicauda*, Philippi, Archiv für Naturg., Jahr. 9, p. 63, pl. iii., fig. 3 a–d.

1878. *Thorellia brunnea*, Boeck, Oversigt over de ved Norges Kyster iagttagne Copepoder, p. 26.

1878. *Thorellia brunnea*, Brady (3), vol. i., p. 95, pl. xvi., figs. 1–10.

By no means a common species in our district, but on other parts of the British coast considerably more abundant; generally on the fronds of *Laminaria saccharina* at or about low-water mark. We have notes of its capture on the Durham coast (exact localities not preserved) and at the roots of Laminariæ at Holy Island. N.D.

CYCLOPS VIRIDIS Jurine.

1878. *Cyclops gigas*, Brady (3), vol. i., p. 105, pl. xx., figs. 1–16.

1891. *Cyclops viridis*, Brady (4), p. 82, pl. v., figs. 6–10.

1901. *Cyclops viridis*, Lilljeborg, Synopsis specierum huc usque in Suecia observatarum generis Cyclopis, Stockholm, p. 8 (separate copy), pl. i.. figs. 6–11.

Common everywhere in fresh water, sometimes even in brackish pools. N.D.

CYCLOPS BICUSPIDATUS Claus.

1891. *Cyclops Thomasi*, Brady (4), p. 80, pl. vi., figs. 1–4.

1891. *Cyclops bicuspidatus*, Brady (4), p. 78, pl. v., figs. 1–5.

1901. *Cyclops bicuspidatus*, Lilljeborg, *loc. cit.*, p. 11, pl. i., figs. 12–17, pl. ii., fig. 1.

In a pond in Lambton Park, county Durham (A. M. N.) D.

CYCLOPS VERNALIS S. Fischer.

1863. *Cyclops elongatus*, Claus (2), p. 97, pl. xi., figs. 1, 2.

1891. *Cyclops elongatus*, Brady (4), p. 70, pl. i., figs. 1–5.

1901. *Cyclops vernalis*, Lilljeborg, *loc. cit.*, p. 17, pl. ii., figs. 5–7.

A form of unfrequent occurrence, characterised by the presence of eighteen joints in the anterior antennæ instead of the usual seventeen, was described by Professor Claus as a distinct species under the name *elongatus*. This is now

generally considered as an abnormality, a variation of *C. vernalis*. Professor Lilljeborg, in his definition of *C. vernalis*, says "Antennæ primi paris . . . articulis 17, rarissime 18 compositæ." Our only record is for the *elongatus* variety. Pools near Broomley Lough (A. M. N.) N.

Cyclops vicinus Uljanin.

1891. *Cyclops vicinus*, Brady (4), p. 77, pl. i., figs. 6–9.

1901. *Cyclops vicinus*, Lilljeborg, *loc. cit.*, p. 26, pl. ii., figs. 16–19.

Our local records are Bolam Lake and Paston Tarn (G. S. B.); Broomley Lake and Fallowlees Lake (A. M. N.) N.

Cyclops strenuus S. Fischer.

1878. *Cyclops strenuus*, Brady (3), vol. i., p. 104, pl. xix., figs. 1–7.

1891. *Cyclops strenuus*, idem (4), p. 73, pl. ii., figs. 1–4.

1891. *Cyclops abyssorum*, idem, ibidem, p. 73, pl. iii.

The form described by Sars under the specific name *abyssorum* seems to be simply a pelagic form of *C. strenuus*, altogether more feebly developed, and generally found at considerable depths below the surface. Of *C. abyssorum* we have records from Crag and Broomley Lakes (A. M. N.); of the *strenuus* form from Belsay, Plessey, Lambton Park, and Seaton Carew. N.D.

Cyclops fuscus (Jurine).

1878. *Cyclops signatus*, Brady (3), vol. i., p. 100, pl. xvii., figs. 4–12, and (4) p. 71 (in part).

1901. *Cyclops fuscus*, Lilljeborg, *loc. cit.*, p. 44, pl. iii., figs. 12–15.

A common species, generally distributed in weedy ponds and ditches. N.D.

Cyclops albidus (Jurine).

1878. *Cyclops tenuicornis*, Brady (3), vol. i., p. 102, pl. xviii., figs. 1–10.

1891. *Cyclops signatus*, idem (4), p. 71 (in part).

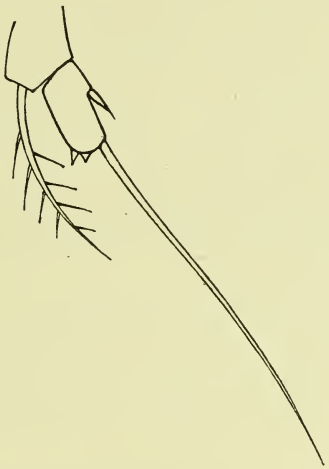
In the same situations as the preceding species, and equally common. N.D.

CYCLOPS INSIGNIS Claus.

1868. *Cyclops Lubbockii*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iii., p. 127, pl. iv., figs. 1–8.

1878. *Cyclops insignis*, Brady (3), vol. i., p. 108, pl. xxi., figs. 1–9, and (6) p. 73, pl. vi., fig. 5 (1891).

Taken many years ago in brackish pools near the edge of Hartlepool Slake. The figure of the fifth foot in Plate xxi. of the Ray Society Monograph is incorrect; that here given was



CYCLOPS INSIGNIS.
Fifth foot, highly magnified.

drawn from a specimen taken at Lymington, Hants, no example from Hartlepool being at present attainable: the figure agrees almost exactly with that given by Claus (G. S. B.) D.

CYCLOPS SERRULATUS S. Fischer.

1878. *Cyclops serrulatus*, Brady (3), vol. i., p. 109, pl. xxii., figs. 1–14, and (4) p. 83, pl. vii., fig. 1 (1891).

Wherever there is water capable of sustaining animal life there may be found *Cyclops serrulatus*. It seems to be less fastidious about impurities and less dependent on the presence

of vegetation than any other species. It is also very widely distributed, occurring, if not from China to Peru, at all events from Turkestan, through Europe, to North America. N.D.

Cyclops macrurus G. O. Sars.

1878. *Cyclops macrurus*, Brady (3), vol. i., p. 111, pl. xxix., figs. 1–5, and (4) p. 84, pl. vii., fig. 2 (1891).

We have no local record of this species except from Crag Lake (A. M. N.) N.

Cyclops affinis G. O. Sars.

1878. *Cyclops affinis*, Brady (3), vol. i., p. 112, pl. xv., figs. 11–14, pl. xxiv.B, figs. 10–15, and (4) p. 86, pl. viii., figs. 1–6 (1891).

Not a common species. Locally it has been found only in the river Till at Etal (A. M. N.) N.

Cyclops fimbriatus S. Fischer.

1878. *Cyclops crassicornis*, Brady (3), vol. i., p. 118, pl. xxiii., figs. 1–6.

1891. *Cyclops fimbriatus*, Brady (4), p. 90, pl. ix., fig. 1.

Found in Bolam Lake, and in a ferruginous ditch by the side of the road between Haydon Bridge and Staward (G. S. B.); Rainton Meadows, county Durham (A. M. N.) N.D.

Cyclops salinus G. S. Brady.

1899. *Cyclops salinus*, Brady, On *Ilyopsyllus coriaceus* and other Crustacea taken at Alnmouth. Nat. Hist. Trans. Northumberland and Durham, vol. xiii., p. 432, pl. xii., figs. 11–15; and On Entomostraca found at the roots of Laminariæ, idem, ibidem (new series, vol. i., p. 7, pl. i., figs. 1–3, 1904).

Found among fuci between tidemarks at Alnmouth and Holy Island (G. S. B.) N.

[Cyclops Kaufmanni Uljanin.

In the Ray Society Monograph (vol. i., p. 113, pl. xxix., figs. 6–12) *C. Kaufmanni* was described and figured, as also in the "Revision" of 1891 (Brady (4), p. 89, pl. vii., fig. 3).

But no indubitably adult specimens have as yet been observed, and it seems best under these circumstances to consider it as an immature form of some other species—perhaps of *C. viridis*. The same remarks apply to *Cyclops Helleri*].

HALICYCLOPS ÆQUOREUS (S. Fischer).

1878. *Cyclops æquoreus*, Brady (3), vol. i., p. 119. pl. xix., figs. 8–10, pl. xxi., figs. 11–17, and (4) p. 91, pl. x., fig. 1 (1891).

Claus in 1893 founded a new genus *Hemicyclops* with *Cyclops æquoreus* as the type. The name, however, having been previously used in a different sense by Boeck, Dr. Norman has proposed to substitute for it that of *Halicyclops*.*

H. æquoreus is essentially a brackish water species, occurring not uncommonly in salt marshes and pools at the side of estuaries. It seems to be generally distributed, but the only local habitat at present known to us is Seaton Sluice, Northumberland (G. S. B.) N.

FAM. 2.—ASTEROCHERIDÆ

DERMATOMYZON NIGRIPES (Brady and Robertson).

1880. *Cyclopicera nigripes*, Brady (3), vol. iii., p. 54, pl. lxxxix., figs. 1–11.

1899. *Dermatomyzon nigripes*, Giesbrecht, Die Asterocheriden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte, Berlin, 1899, p. 77, pl. i., fig. 4, pl. v., figs. 1–14.

A fine and well characterized species, not uncommon in moderate depths of water. Off Marsden and Hawthorn in 25 to 27 fathoms. Off Alnmouth 50 to 59 fathoms (G. S. B.) N.D.

ASTEROCHERES LATA (G. S. Brady).

1880. *Cyclopicera lata*, Brady (3), vol. iii., p. 56, pl. lxxxix., fig. 12, pl. xc., figs. 11–14.

One specimen among algæ in a tidal pool at Roker (G. S. B.) This species is normally parasitic on *Echinus*

* On new generic names for some Entomostraca (Annals and Magazine of Natural History, ser. 7, vol. xi., April, 1903).

esculentus, and the free-swimming condition in which it is frequently found is probably only temporary. The parasitic Crustacea of our district have been scarcely at all investigated, and will form a rich field for future research. The identification of this species with *Ascomyzon echinicola* Norman appears to have been erroneous. There are rather conspicuous differences in the fifth pair of feet and other points, but these need examination with the aid of further specimens, not at present attainable. D.

Asterocheres Boecki (G. S. Brady).

1880. *Artotrogus Boecki*, Brady (3), p. 60, pl. xci., figs. 1–9.

1899. *Asterocheres Boecki*, Giesbrecht, Die Asterocheriden des Golfes von Neapel und der angrenzenden Meeres-Abschnitte, Berlin, 1899, pp. 75 and 100, pl. i., fig. 2, pl. ii., figs. 22–31.

In a tidal pool, Alnmouth, September, 1899 (G. S. B.)

Like the preceding, probably a truly commensal or parasitic species only accidentally found in a free condition. N.

Asterocheres violaceus (Claus).

1889. *Echinocheres violaceus*, Claus, Ueber neue oder wenig bekannte halbparasitische Copepoden, p. 30, pl. vi., figs. 1–10.

1899. *Asterocheres violaceus*, Giesbrecht, *loc. cit.*, pp. 76 and 101, pl. i., fig. 1, and pl. ii., figs. 34-42.

1899. *Echinocheres violaceus*, Brady, On *Ilyopsyllus coriaceus* and other Crustacea taken at Alnmouth. Nat. Hist. Trans. Northumberland and Durham, vol. xiii., p. 437, pl. xii., figs. 9, 10.

1899. *Cyclopicera berniciensis*, idem ibidem, p. 438, pl. xiii., figs. 1–8.

Two specimens taken in the free condition in a tidal pool near low-water mark at Alnmouth (G. S. B.)

The name *Cyclopicera berniciensis* must be withdrawn, having been founded upon a mutilated male specimen of *Asterocheres violaceus*.

ACONTIOPHORUS SCUTATUS Brady and Robertson.

1880. *Acontiophorus scutatus*, Brady (3), vol. iii., p. 69, pl. xc., figs. 1–10.

Dredged in 27 fathoms off Hawthorn (G. S. B.) D.

BRADYPONTIUS MAGNICEPS (G. S. Brady).

1880. *Artotrogus magniceps*, Brady (3), vol. iii., p. 61, pl. xciii., figs. 1-9.

1899. *Bradypontius magniceps*, Giesbrecht, *loc. cit.*, p. 88, pl. vi., figs. 41–44.

A few specimens dredged off Castle Eden in 20 fathoms. D.

CRIBROPONTIUS NORMANI (Brady and Robertson).

1880. *Artotrogus Normani*, Brady (3), vol. iii., p. 63, pl. xci., figs. 12–15; pl. xcii., fig. 14, pl. xciii., fig. 10.

1899. *Cribropontius Normani*, Giesbrecht, *loc. cit.*, p. 86, pl. vii., figs. 40–47.

A few specimens dredged six miles off Hawthorn in a depth of 27 fathoms (G. S. B.) D.

DYSPONTIUS STRIATUS Thorell.

1880. *Dyspontius striatus*, Brady (3), vol. iii., p. 65, pl. xcii., figs. 1–13.

1899. *Dyspontius striatus*, Giesbrecht, *loc. cit.*, p. 90, pl. i., fig. 10, pl. vii., figs. 1–11.

Dredged off Hawthorn in company with the foregoing species (G. S. B.) D.

MICROCANCERILLA, nov. gen.

Body oblong, urosome distinctly separate from metasome; antennules short, six-jointed; mandibles simple, falcate; maxillæ club-shaped; anterior and posterior maxillipeds clawed, prehensile; three pairs of biramose swimming feet.

MICROCANCERILLA CŒRULEOCRUCIATA, n. sp. Plate IX. (A).

Female. Length 0·42 mm. Cephalothorax oblong-ovate, last segment expanded laterally and produced backwards, forming two acute subfalcate processes, each of which bears near the tip a single rigid seta (?rudimentary fourth foot);

abdomen four-jointed, the joints very short and nearly equal in length; caudal stylets short, quadrate, scarcely longer than broad, sharply angulated at the outer distal edge; bearing one long rigid apical seta and two very small ones. Antennules short and stout, six-jointed, the terminal joint bearing four setæ; mandibles small, consisting of a single stout curved limb without any palp; maxillæ simple, claviform, dilated at the extremity, which bears a few simple setæ; anterior maxillipeds bearing a very long and slender terminal claw; posterior similarly formed, but with a much shorter and more robust unguis; three pairs of swimming feet, each with a robust basal joint, and two tri-articulate branches. The siphon is apparently slender and tubular, but was only indistinctly seen. The animal is nearly colourless, except that the alimentary tract is coloured so as to form in the recent condition a brilliant blue cross. Three specimens were taken by A. M. N. in a brackish pool by the side of the stream at Seaton Sluice in June, 1885, but renewed search in the same place has failed to disclose further specimens. The animal is evidently a suctorial one, and doubtless a parasite which in this case had become detached from its host. No species at all nearly corresponding to it has apparently been described. Its nearest allies are probably *Cancerilla* Dalyell and *Botryllophilus* Hesse, and it would appear not at all unlikely that the host may prove to be one of the Amphipods or Isopods which abound in salt marshes, or possibly the shore crab. N.

Fam. 3.—ONCÆIDÆ

Oncæa anglica G. S. Brady.

1905. *Oncœa anglica*, Brady, On Copepoda and other Crustacea taken off Northumberland and Durham in July, 1904. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle, new series, vol. i., p. 220, pl. vi., figs. 1–9.

One specimen only—a female—was found in washings of dredged material taken between St. Mary's Island and Souter Point (G. S. B.) N.

Fam. 4.—LICHOMOLGIDÆ

Lichomolgus fucicola G. S. Brady.

1872. *Macrocheiron fucicolum*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iv., p. 434, pl. xviii., figs. 9–18.

1880. *Lichomolgus fucicola*, Brady (3), vol. iii., p. 41, pl. lxxxv., figs. 1–11.

Found not unfrequently among fuci at and beyond low-water mark, as well as in greater depths among dredged material. Though often found free-swimming, the natural habit of this genus would seem to be symbiotic in the branchial cavities of Ascidians. Our local records are St. Mary's Island, Alnmouth, and Ryhope, among fuci, and in dredgings from four miles off Hawthorn and Marsden in about 25 fathoms (G. S. B.) N.D.

Pseudanthessius liber (Brady and Robertson).

1875. *Lichomolgus liber*, B. and R., Brit. Assoc. Report, p. 197.

1880. *Lichomolgus liber*, Brady (3), vol. iii., p. 44, pl. lxxxvi., figs. 1–13.

(*Pseudanthessius*, Claus, Ueber neue oder wenig bekannte halbparasitische Copepoden, Wien, 1889).

In dredgings from North Sunderland, Marsden, and Hawthorn (G. S. B.) N.D.

Pseudanthessius Thorellii (Brady and Robertson).

1875. *Lichomolgus Thorellii*, B. and R., Brit. Assoc. Report, p. 197.

1880. *Lichomolgus Thorellii*, Brady (3), vol. iii., p. 47, pl. lxxxviii., figs. 1–9.

Off Marsden in 25 fathoms, and off Northumberland coast (G. S. B.) N.D.

Hermannella arenicola (G. S. Brady).

1872. *Boeckia arenicola*, Brady, Nat. Hist. Trans. Northumberland and Durham, vol. iv., p. 430.

1880. *Lichomolgus arenicolus*, Brady (3), vol. iii., p. 46, pl. lxxxvii., figs. 1–7.

Dredged off Seaton Carew in four fathoms (G. S. B.) D.

Section IV.—NOTODELPHYOIDA

Fam. 1.—NOTODELPHYIDÆ

The Entomostraca belonging to this family are normally parasitic or symbiotic in the interior of Ascidians, though sometimes found as free-swimmers.

Notodelphys cœrulea Thorell.

1859. *Notodelphys cœrulea*, Thorell, Bidrag till Kännedomen om Krustaceer som lefvai Arter af Slægter Ascidia, p. 37, pl. iii. and iv., fig. 1.

1878. *Notodelphys cœrulea*, Brady (3), vol. i., p. 130, pl. xxvii., figs. 10–13.

In the branchial sac of *Ascidia parallelogramma* off Hawthorn (G. S. B.) D.

Notodelphys agilis Thorell.

1859. *Notodelphys agilis*, Thorell, *loc. cit.*, p. 40, pls. iv., v., fig. 6.

1878. *Notodelphys agilis*, Brady (3), vol. i., p. 130, pl. xxvi., figs. 1–10.

In Ascidians taken off the coast of Durham in 20 to 30 fathoms (G. S. B.) D.

Ascidicola rosea Thorell.

1859. *Ascidicola rosea*, Thorell, *loc. cit.*, p. 39, pls. ix., x., fig. 13.

1878. *Ascidicola rosea*, Brady (3), vol. i., p. 145, pl. xxx., figs. 1–10.

In Ascidians taken off Northumberland and Durham (G. S. B.) N.D.

Doropygus pulex Thorell.

1859. *Doropygus pulex*, Thorell, *loc. cit.*, p. 46, pl. vi., fig. 8.

1878. *Doropygus pulex*, Brady (3), vol. i., p. 133, pl. xxviii., figs. 1–12.

In Ascidians from the coasts of Northumberland and Durham (G. S. B.) N.D.

Doropygus porcicauda G. S. Brady.

1878. *Doropygus porcicauda*, Brady (3), vol. i., p. 138, pl. xxvii., figs. 1–9, pl. xxxiii., figs. 14–16.

From Ascidians dredged in 27 fathoms off Hawthorn, and in 21 fathoms off Souter Point (G. S. B.) D.

Section V.—MONSTRILLOIDA

Fam. 1.—MONSTRILLIDÆ

Monstrilla grandis? Giesbrecht.

1892. *Monstrilla grandis*, Giesbrecht, Pelagische Copepoden des Golfes von Neapel, pp. 586, 588.

1901. *Monstrilla grandis*, Brady, On Copepoda and other Crustacea taken in Ireland and on the North-East Coast of England. Nat. Hist. Trans. Northumberland and Durham, vol. xiv., p. 64, pl. iv., figs. 1–3.

One specimen taken in the bottom-net at Cullercoats in July, 1900 (G. S. B.). A single specimen (species doubtful) taken at Seaton Carew, May, 1866. N.D.

Section VI.—CALIGOIDA

Fam. 1.—ERGASILIDÆ

Bomolochus soleæ Claus.

1863. *Bomolochus soleæ*, Claus, Zeitsch. f. wiss. Zool., vol. xiv., p. 383, pl. xxxv., figs. 16–20.

1893. *Bomolochus soleæ*, T. Scott, Eleventh Annual Report Fishery Board for Scotland, p. 212, pl. v., figs. 1–10.

1906. *Bomolochus soleæ*, A. Brian, Copepoda parassiti dei Pesci d'Italia, p. 31.

1909. *Bomochus soleæ*, Bainbridge (May E.), Notes on some Parasitic Copepoda. Trans. Linn. Soc., ser. 2, vol. xi., p. 45.

From nostrils of cod, found by Miss Lebour on fish brought into North Shields. Miss Lebour placed this, and other

species which follow, in Miss May E. Bainbridge's hands for identification and description. N.

Fam. 2.—CALIGIDÆ

Caligus rapax M. Edwards.

A common parasite on various fishes. N.D.

Caligus curtus O. F. Müller.

Parasitic on cod and its allies; very common. N.D.

Lepeophtheirus salmonis (Kröyer).

Specimens in the British Museum, "Berwick, parasitic on salmon, Dr. Baird." It is *L. Strœmii* of Baird. N.

Lepeophtheirus hippoglossi (Kröyer).

On the holibut, Berwick Bay (Dr. Johnston); Seaham Harbour (G. H.). N.D.

Trebius caudatus Kröyer.

Common on skate. N.D.

Echthrogaleus coleoptratus (Guérin).

1850. *Dinemoura alata*, Baird (1), p. 285, pl. xxxii., figs. 6, 7.

On a Beaumaris shark, Berwick Bay (Dr. Johnston). N.

Dinemoura producta (O. F. Müller).

1850. *Dinemoura lamnæ*, Baird (1), p. 286, pl. xxxiii., fig. 8.

"Taken from a Beaumaris shark *(Lamna monensis)* in Berwick Bay, September, 1844" (Dr. Johnston). N.

Cecrops Latreillii Leach.

On a sunfish off the Tyne (John Hancock); on sunfish, St. Mary's Isle (G. S. B.) N.D.

Section VII.—LERNÆOIDA

Fam. 1.—SPLANCHNOTROPHIDÆ

Splanchnotrophus brevipes A. Hancock and Norman.

1863. *Splanchnotrophus brevipes*, A. Hancock and Norman, "On Splanchnotrophus, an undescribed genus of Crustacea parasitic in Nudibranchiate Mollusca." Trans. Linn. Soc., vol. xxiv., p. 55, pl. xvi., figs. 1–6.

Two specimens of this species were found by A. Hancock on as many examples of *Eolis rufibranchialis* from Whitley (see Alder and Hancock, Nudibranchiate Mollusca, p. 26), and others from *Doto coronata* from rock pools at Cullercoats by H. T. Mennell and A. Hancock.

Dr. Thomas Scott has described a parasite of *Lomanotus genei* under the name *Lomanoticola insolens*, which is very closely allied to, if not the same as the foregoing (Ann. and Mag. Nat. Hist., ser. 6, vol. xvi., 1895, p. 360, pl. xvii., figs. 1, 2). N.

Fam. 2.—CHONDRACANTHIDÆ

Chondracanthus lophii Johnston.

On the angler at Cambois (G. S. B.) N.

Chondracanthus annulatus Olsson.

1860. *Chondracanthus annulatus*, Olsson, Prod. faunæ Copep. parasit. Scandinaviæ. Lund. Univ. Arsskift, p. 30, pl. ii., figs. 13–15.

1886. *Chondracanthus læviraiæ*, Valle (A.), Crost. parassit. dei Pesci del Mare Adriatico. Boll. Soc. Adriat. Sc. Nat., vol. vi., p. 73.

1900. *Chondracanthus annulatus*, T. Scott, Eighteenth Report Fishery Board for Scotland, p. 164, pl. vii., figs. 46–51.

1909. *Chondracanthus inflatus*, Bainbridge (May E.), Notes on some Parasitic Copepoda. Trans. Linn. Soc., ser. 2, vol. xi., p. 47, pl. ix., figs. 9–15.

A single immature specimen found on the gills of *Raia radiata*, North Shields (Miss Lebour).

We cannot doubt that Miss Bainbridge's species is *C. annulatus* of Olsson. We (A. M. N.) have cotypes of that species in our collection, and also cotypes of *Chondracanthus pallidus* received from Prof. E. Van Beneden, which seems to be the same species; but at this moment we fail to call to mind where the description of that author is to be found. N.

Fam. 3.—LERNÆOPODIDÆ

Lernæopoda salmonea (Linné).

1850. *Lernæopoda salmonea*, Baird (1), p. 335, pl. xxxv., fig. 6.

1872. *Lernæopoda salmonea*, A. Fric, Die Krustenthiere öhmens, p. 214, and woodcut.

1900. *Lernæopoda salmonea*, T. Scott, Eighteenth Report Fishery Board for Scotland, p. 173, pl. viii., fig. 26.

From the gills of a salmon taken in the Coquet, 1908 (E. L. Gill). N.

Lernæopoda cluthæ T. Scott.

1900. *Lernæopoda cluthæ*, T. Scott, Eighteenth Report Fishery Board for Scotland, p. 173, pl. viii., figs. 27–37.

1909. *Lernæopoda cluthæ*, Bainbridge, *loc. cit.*, p. 49, pl. x., figs. 24–27.

About twelve females were taken from the gills of *Raia radiata* from North Shields by Miss Lebour.

Brachiella pastinaca P. J. Van Beneden.

1909. *Brachiella pastinaca*, Bainbridge, *loc. cit.*, p. 50, pl. viii., figs. 6, 7, pl. ix., fig. 8.

A single specimen of what Miss Bainbridge takes to be this species was found by Miss Lebour in the spiracle of the piked dogfish *(Acanthias vulgaris)*. The species was added to the British fauna by Mr. T. Scott in 1904. N.

?Brachiella Parkeri G. M. Thompson.

? 1889. *Brachiella Parkeri*, G. M. Thompson, Trans. New Zealand Instit., vol. xxii., p. 374, pl. xxviii., fig. 8 a, b.

1909. *Brachiella Parkeri*, Bainbridge, *loc. cit.*, p. 52, pl. ix., figs. 16, 17, pl. x., figs. 18–23.

"One specimen of what I take to be this species, or one closely allied to it, was obtained by Miss Lebour from the gills of the long-nosed skate *(Raia oxyrhynchus)*" (Bainbridge). N.

Anchorella uncinata (O. F. Müller).

Common on the gills of cod and haddock. N.D.

ANCHORELLA RUGOSA Kröyer.

1900. *Anchorella rugosa*, T. Scott, Eighteenth Annual Report Fishery Board for Scotland, p. 176, pl. viii., figs. 45–48.

1909. *Anchorella rugosa*, Bainbridge, *loc. cit.*, p. 55, pl. x., figs. 28–32, pl. xi., figs. 33–37.

Fairly common on the gills of the catfish *(Anarrhichus lupus)*, North Shields (Miss Lebour). N.

FAM. 4.—LERNÆIDÆ

LERNÆA BRANCHIALIS Linné.

Common on cod.

ORDER X.—CIRRIPEDIA

SECTION I.—THORACICA

DIVISION 1.—OPERCULATA

FAM. 1.—BALANIDÆ

BALANUS TINTINNABULUM (Linné).

Ship's bottom, Shields (J. Alder). D.

BALANUS PORCATUS Da Costa.

Common and often very fine off the coast on "*Fusi*," *Modioli*, *Balanus Hameri*, etc. A specimen in Mr. Alder's collection measured 1⅓-in. high and 1¾-in. wide. N.D.

BALANUS CRENATUS Bruguiére.

Attached to shells, *Modioli*, etc., in deep water. N.D.

BALANUS BALANOIDES (Linné).

Common on rocks between tidemarks. N.D.

BALANUS HAMERI (Ascanius).

In deep water attached to shells, sticks, etc. More especially on "*Fusi*" and *Modioli*. Magnificent groups sometimes occur; and in such a group in Mr. Hancock's collection one Balanus measured 3½ inches high and 1⅛ inches broad. N.D.

FAM. 2.—VERRUCIDÆ

VERRUCA STRŒMIA (O. Müller).

On *Balanus Hameri* and *porcatus*, and on shells. N.D.

Division 2.—PEDUNCULATA

Fam. 3.—LEPADIDÆ

Lepas anatifera Linné.

On ships' bottoms, etc. A specimen in Mr. A. Hancock's collection measured 10½ inches long, with the capitulum 1¼ inches long, and rather more than ¾-inch broad. N.D.

Lepas ansiferina Linné.

On ships' bottoms; a large number of specimens were in Mr. Hancock's collection. N.D.

Lepas fascicularis Ellis and Solander.

In 1857 large numbers of this species were cast up on the shore at Marsden and all along the Whitley sands (*fide* J. Alder and A. Hancock). In the Newcastle Museum are examples from Tynemouth, August, 1878 (Dr. W. B. Clarke); and a cluster attached to a floating bottle from the Northumberland coast, 1894. N.D.

Conchoderma aurita (Linné).

From ship's bottom (A. Hancock). N.D.

Conchoderma virgata (Spengler).

From ship's bottom (A. Hancock). N.D.

Scalpellum vulgare Leach.

Common in deeper water attached to branching Polyzoa and Hydroids. N.D.

Section II.—CRYPTOSOMATA

Trypetesa lampas (A. Hancock).

1849. *Alcippe lampas*, A. Hancock, Note on the occurrence on the British coast of a Burrowing Barnacle belonging to a new order of the Class Cirripedia. Ann. and Mag. Nat. Hist., ser. 2, vol. iv., p. 305, pls. viii., ix.

1854. *Alcippe lampas*, C. Darwin, Mon. Cirripedia, Balanidæ, pp. 530 and 630, pl. xxii.

1903. *Trypetesa lampas*, Norman, New generic names for some Entomostraca and Cirripedia. Ann. and Mag. Nat. Hist., ser. 7, vol. xi., p. 369.

The name *Alcippe* having previously, in 1847, been employed by Blyth for a genus of birds, it has been necessary to change it for the Cirriped.

Burrowing in shells of *Buccinum* and of "*Fusi*," in deep water off the coasts (A. Hancock and A. M. N.) N.D.

Section III.—RHIZOCEPHALA Fr. Müller.

Peltogaster paguri H. Rathke.

1843. *Peltogaster paguri*, H. Rathke, Beiträge zur Fauna Norwegens, p. 245, pl. xii., fig. 17.

1859. *Peltogaster paguri*, Lilljeborg, Les Genres Liriope et Peltogaster (Extr. Nov. Act. Reg. Soc. Sci., Upsala, ser. 3, vol. iii.), p. 25, pl. i., figs. 1, 2, pl. ii., figs. 30-55.

1860. *Peltogaster paguri*, Lilljeborg, Supplément au Mémoire sur les genres Liriope et Peltogaster (Extr. Nov. Acta. Reg. Soc. Sci., Upsala, ser. 3, vol. iii.), p. 11, pl. vii., figs. 19, 20, 22–27.

Parasitic on the abdomen of *Pagurus bernhardus* off Sunderland, 1863 (A. M. N.) D.

Peltogaster sulcatus Lilljeborg.

1860. *Peltogaster sulcatus*, Lilljeborg, Supplément au Mémoire sur les genres Liriope et Peltogaster (Extr. des Nov. Act. Reg. Soc. Sci., Upsala, ser. 3, vol. iii.), p. 16, pl. vii., figs. 21-28, pl. viii., figs. 29–38, pl. ix., figs. 39, 40.

Gregariously parasitic on the abdomen of *Anapagurus lævis* off Sunderland, 1863 (A. M. N.) D.

Clistosaccus paguri Lilljeborg.

1860. *Clistosaccus paguri*, Lilljeborg, l.c., p. 9, pl. vi., fig. 15, pl. vii., figs. 16–18.

On *Anapagurus lævis* off Seaham, 1863 (A. M. N.) D.

Sacculina carcini I. V. Thompson.

Occasionally found on *Carcinus mænas*, and dredged off Berwick in 1863 on abdomen of *Portunus holsatus* (A. M. N.) N.D.

DESCRIPTION OF PLATES

Plate VIII.

Fig. 1. Diastylis Bradii, Norman, female from above.
2. ,, ,, from the side.

Plate IX.

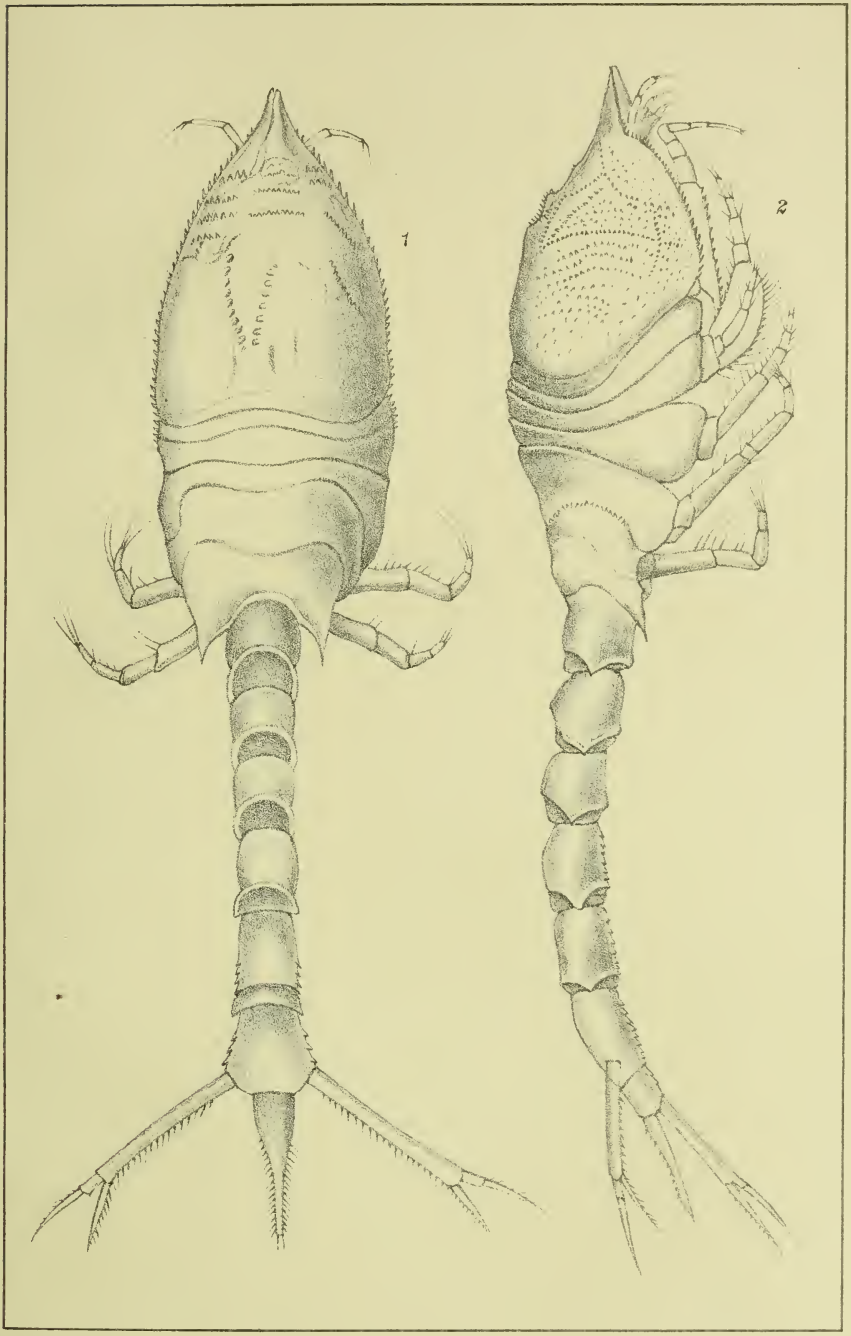
Fig. 1. Diastylis Bradii, Norman, male.
2. ,, ,, female, third maxilliped.
3. ,, ,, ,, first peræopod.
4. ,, ,, ,, second peræopod.
5. ,, ,, ,, last peræopod.
6. ,, ,, ,, telson and uropods.

The serration of the lateral line in the figure of the male is too strongly indicated. Differing from that of allied species, it is so minute that it is with difficulty discernible under the microscope.

Plate IX. (a).

Microcancerilla cœruleocruciata, nov. gen. et sp.

Fig. 1. Female × 186.
2. Urosome and last thoracic segment × 300.
3. Antennule × 300.
4. Mandible × 500.
5. Maxilla × 500.
6. Anterior maxilliped × 300.
7. Posterior maxilliped × 300.
8. One of the swimming feet × 300.



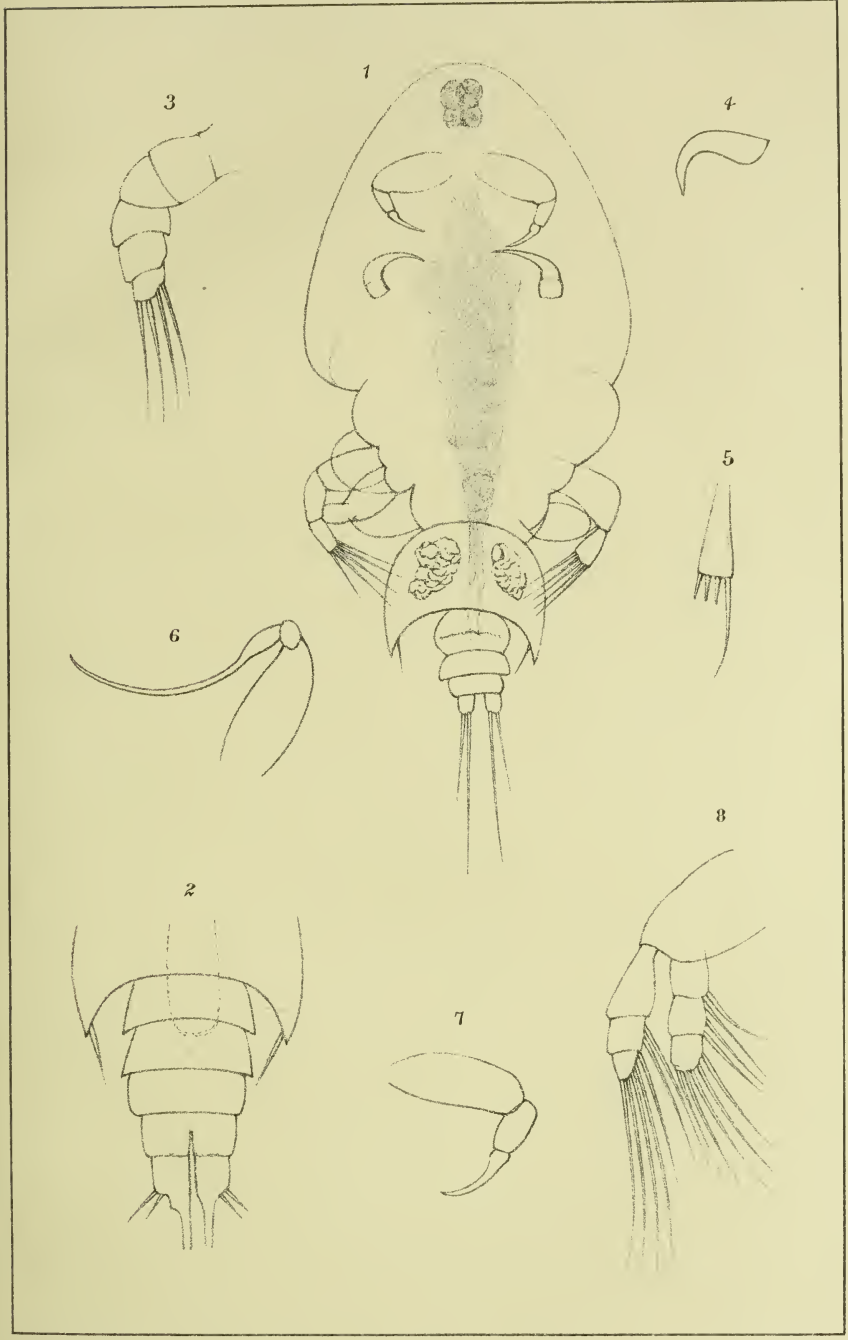
G. S. Brady del.

W. West lith.

DIASTYLIS BRADYI ♀.

G. S. Brady del. W. West lith.

DIASTYLIS BRADYI ♂.



G.S. Brady del. W West lith.

MICROCANCERILLA CŒRULEOCRUCIATA ♀.

CORRIGENDA

The list of Crustacea of the two counties given on p. 256 has been influenced by additions or otherwise during the publication of the catalogue. The following is a summary of species as now known :—

Brachyura	22	Phyllocarida	1
Anomura	15	Cladocera	49
Macrura	22	Ostracoda	121
Schizopoda	14	Copepoda	169
Sympoda	26	Cirripedia	17
Isopoda	57		
Amphipoda	131		644

Page 361 to 364.—Date of publication of parts of Sars's work quoted should be 1902 (not 1901).

Page 365.—Date of part of Sars's work quoted should be 1903 (not 1901).

INDEX TO GENERA

Names printed *in italics* refer to synonyms.

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On some Rare Arachnids obtained during 1908

By A. Randell Jackson, M.B., M.Sc.

(With Plate X.)

During the past year I have had little opportunity of collecting or examining Arachnids. Several spiders, however, which I have come across are new to the British fauna, and one appears to be new to science. Of this I have only a solitary female captured near Chester. It is a Cornicularia, and it is so distinct from all its congeners that I here publish a description and figure of it. I have called it *C. valida*. At the end of May I captured a couple of specimens of *Araneus dromedarius* (Walck.) amongst heather at Burnham Beeches in Buckinghamshire. This is a fine and striking addition to our fauna. In the New Forest a few days later both sexes of *Araneus Sturmii* (Hahn) occurred. I subsequently found examples of this distinct species in my collection, where they had been included with specimens of *A. triguttatus* (Fab.) under the latter name. Mr. Cambridge also found *A. Sturmii* in his collection in a similar situation, and a supposed example of *A. triguttatus* sent to me by Mr. Falconer turned out also to be *A. Sturmii*. No doubt both species are really more or less common in Britain, but *A. Sturmii* (Hahn) has never been recorded from our islands previously. Finally Mr. D. R. Pack-Beresford sent me in November two females of the Oonopid *Triœris stenaspis* (Sim.) from a hot-house in the Botanic Gardens at Glasnevin near Dublin. This species has of course no claim to be considered as a member of our fauna. As, however, practically all our British animals (ourselves included) are immigrants of only a slightly earlier date, it seems to me that exotic forms capable of living under any circumstances in our country are of considerable scientific interest. These minute spiders of the family Oonopidæ seem to have no difficulty in living and reproducing their species in a suitable temperature at almost any latitude. Besides these four additions to our fauna there are several other notes of interest. I am figuring the palpus

of *Prosthesima latitans* (L. Koch) since there are no figures of it in British literature. The spider has, however, occurred in Britain before. Another observation is that on the web-spinning habits of *Theridiosoma argenteolum* (Camb.). The beautiful Epeiroid web of this little spider had not previously been observed in Britain, and it is not yet certain that our species is identical with either the European or American members of the genus. There are several other records of rare or semi-rare species, and I here include also the figures of the new Tartarid *Trithyreus Bagnallii* (Jackson) described in a previous paper.

Let me again thank my correspondents for all their kindness in sending me specimens. To Messrs. Wallis Kew, Evans, Hull, Falconer, Butterfield, Britten, Pack-Beresford, and W. P. Winter my thanks are due. Once more too I must record my thanks to those authorities who have so kindly assisted me with advice and specimens. These are, of course, Mr. Cambridge, who has seen all the new spiders and many of the others, and has given me much assistance and information both by letter and during a stay at Bloxworth Rectory in June. M. E. Simon has also examined the little Oonopid and confirmed my identification of it, while Professor Kulczynski has compared several of my specimens with Continental forms in his possession.

Order ARANEÆ

Family OONOPIDÆ

Triæris stenaspis (Sim.) (Plate X., figs. 12, 12a, 12b.)

This little spider bears a strong superficial resemblance to *Ischnothyreus velox* (Jackson). It can, however, easily be distinguished from that spider by the arrangement of its eyes, by the structure of its legs, and by striking differences in its scuta.

The *male* is unknown. The *female* is 1·8 mm. in length, which is about the average of *I. velox*. In general facies it

resembles that spider, from which, however, it differs in being of a generally redder colour, especially as to the scuta.

The EYES are arranged much as in *O. pulcher* (Templ.). That is to say, the posterior row consists of four large oval eyes, of which the centrals are slightly larger than the laterals. All four are in contact, and the row is curved, the slight convexity being in front. The two anterior eyes are separated by a space equal to the diameter of one of them. In *I. velox*, on the contrary, they are in contact, and the six eyes surround completely a small portion of the caput.

The LEGS show a very curious dissimilarity in the patellæ of the several pairs. These decrease in length from before backwards. The first patellæ are very long, nearly equalling the first tibiæ in this respect. The fourth patellæ are the shortest. In *I. velox* on the other hand the patellæ are all short and approximately equal. The patellæ and tibiæ of the first two pairs of legs each bear beneath a double row of distinct but not very long spines. There are three pairs of these on each patella and five pairs on each tibia. These are absent on the third and fourth pairs of legs. The metatarsi bear beneath some rather long hairs but no spines. The spines borne on the patellæ and tibiæ of the first two pairs of legs are erect or nearly so; they are much weaker than the spines borne on the tibiæ and metatarsi of the first two pairs of legs in *I. velox*. These last are recumbent and lie along the long axis of their respective joints. In both species, however, the spines are probably capable of a considerable amount of movement at their socket-like bases.

The ABDOMINAL SCUTA are very characteristic. The DORSAL SCUTUM is of a long oval form. It begins near the anterior end of the abdomen, and covers about *two-thirds* of its length. It is, however, very narrow, and leaves on each side a wide area uncovered. It is of a reddish brown hue. In *I. velox* the colour is paler, and the scutum only reaches *halfway down* the abdomen.

The EPIGASTRIC SCUTUM covers the epigastric region, and the pulmonary sacs; it embraces the abdominal pedicle and

reaches the dorsum, where its superior border is seen to form a distinct chitinous ridge at the anterior part of the abdomen in front of the dorsal scutum. Behind it terminates in a concave border, forming the anterior lip of the *rima genitalis*. At each side of this posterior border is the opening of one of the anterior spiracles which lead into the pulmonary sacs. This scutum is of a reddish brown colour.

The VENTRAL SCUTUM forms the posterior lip of the *rima genitalis*. It is somewhat kidney-shaped, being slightly concave in front. The central part, corresponding with the hilum of the kidney, is naked and of a shining grey colour. It is semilunar in shape, and shows a short median groove running towards the rima in the long axis of the spider's body. It bears no hairs. The rest of the scutum is of a reddish brown colour, and bears numerous hairs, these forming a regular fringe round the central naked part. On the lower surface of the abdomen in the middle line, and behind the posterior edge of the ventral scutum, a dark convoluted duct is seen through the integuments. This runs forward, and can be traced behind the scutum to the posterior border of the central naked part, where it disappears. Probably this is the oviduct, but it is in quite a different position from the somewhat similar structure seen in *I. velox*.

The posterior spiracles pierce the ventral scutum near its anterior border, and at some distance from the middle line. Each is oval, and is placed slightly nearer the middle line than the corresponding anterior spiracle. The apertures seem absolutely independent, and there is no groove or ridge or band of modified chitin connecting them. I regret that I have not had a spare specimen which I could eviscerate and treat with liquor potassæ in order to study the arrangement of the tracheæ.

At the posterior end of the ventral surface of the abdomen is a small narrow curved plate. This is known as the inframammillary scutum. It is not well developed in the present genus.

The whole of the ventral scutum is larger, redder, and better developed than in *I. velox*.

The genus *Triæris* (Sim.) contains only one species, which is of course the present one. One of the specimens was sent to M. E. Simon, who kindly confirmed my identification of it. It inhabits Venezuela and the West Indies. In November, 1908, two females were sent to me by Mr. D. R. Pack-Beresford. These had been found by himself and Mr. R. S. Bagnall inhabiting a hothouse at the Botanic Gardens at Glasnevin near Dublin. The species also occurs in similar situations in Paris. This is the third species of exotic Oonopid found living in hothouses in Britain in a little over a year. Doubtless more of these interesting little animals await discovery, as they seem easily acclimatized if the temperature is high enough for them.

Family ARGIOPIDÆ

Cornicularia valida sp. nov. (Plate X., fig. 10).

Length of the female 2·9 mm. The spider is rather larger than the average of *C. cuspidata* (Bl.), but one or two females of that species which I have seen reach the same length. *C. unicornis* (Camb.) is a much smaller spider, the largest specimen I have seen measuring only 2·75 mm. The present species is, however, more massive than either of its congeners.

Colour.—The whole spider is of a very dark colour. The cephalothorax is of a deep shining red brown, the abdomen is black above, very dark brown below.

Cephalothorax.—This is devoid of any ocular eminence or any post-ocular striæ. It slopes up nearly uniformly from the thoracic juncture; its profile, however, shows a slight dip at the occiput.

Eyes.—Eight in number, and arranged in two rows. All are rather small. The *posterior row* is straight, and the eyes are subequal. The centrals are one diameter apart, and each is separated from its adjacent lateral by a space about equal to one and a half times its diameter. The *anterior row* is

straight, the centrals are the least, and are separated by a space equal to half their diameter. Each is more than one diameter from its adjacent lateral. The trapezium formed by the four central eyes is a good deal longer than broad, and narrower in front than behind.

Clypeus.—About equal to ocular area.

Falces.—These are shaped as in the other Cornicularieæ. They are strong and of a dark brown colour.

Sternum.—Almost black, shining and bearing numerous punctiform impressions. The apex is broad and truncated. It is, however, much narrower than the fourth coxæ which it separates.

Maxillæ, labium, and spinners.—All these are of a paler brown than the rest of the under surface. None of them appear to present any abnormal features.

Vulva.—This is very characteristic, and I give a figure of it (see plate). It is built on the same lines as that of *C. unicornis* (Camb.), but is quite different in details. It is the palest part of the ventral surface.

Legs.—These are all of a clear yellowish brown colour, and are covered with numerous fine stiff hairs. Each *patella* bears above a stiff bristle. True spines are present on all the *tibiæ*. Those of the first two pairs bear two spines above in each case. In the two posterior pairs the second or apical spine is wanting. Sensory (acoustic) setæ are present on all the *tibiæ* and *metatarsi*. The tarsal claws are three in number on each limb.

I have not described this spider in detail, as it closely resembles the other members of the genus. Its vulva, however, easily distinguishes it from these. In *C. cuspidata* (Bl.) and *C. unicornis* (Camb.) the posterior eyes are equidistant. In the present species, on the contrary, the centrals are nearer together than each is to its adjacent lateral. This, however, is a distinction which may not hold good in a long series. The solitary example of *C. valida* as yet obtained is much

above the average size of the genus. It may, however, be equalled in this respect by *C. cuspidata* (Bl.).

A single female of this spider was found by me amongst dead leaves under a thorn bush on the cop or river bank at Saltney Ferry, not far from the estuary of the Dee in Cheshire. I feel confident that it belongs to an undescribed species, and Mr. Cambridge, to whom I submitted the specimen, agrees with me. I hope next year to obtain more specimens in which both sexes will be included.

Araneus dromedarius (Walck.). (Plate X., figs. 8, 8a).

Two females of this interesting species were obtained at Burnham Beeches on May 30th, 1908, by Mr. Wallis Kew and myself. They were captured by sweeping heather growing in an open place. This is the first British record for the species.

A. dromedarius (Walck.) is well figured, and its distinctions clearly noted, by Chyzer and Kulczynski* and Bösenberg†. Since, however, there are no notes on the subject in British literature, a few remarks on it may be useful. It is closely related to *Araneus gibbosus* (Walck.), a fairly common spider in the South of England, but can be easily distinguished from it by its facies, colour, and the structure of its vulva. In size *A. dromedarius* is rather larger than British examples of *A. gibbosus*, the smaller of my two specimens measuring 7·5 mm. The difference in shape is connected with the abdominal tubercles. These in *gibbosus* are directed nearly vertically upwards, their outward direction being distinct enough but slight. In *dromedarius* the reverse is the case, the tubercles whilst they have a slight upward direction, running almost horizontally outwards. In colouring too the spiders are very different. In *A. gibbosus* the ground colour is usually greyish green, ranging, however, from almost black to bright green. Its hues thus generally correspond more or less

* Araneæ Hungariæ, Tome I., pp. 118, 125, Tab. V., figs. 3a, 3b.

† Die Spinnen Deutschlands, p. 23, Taf. I., fig. 10.

with the lichen-covered twigs on which it generally rests. A very ill defined and broken white or grey line usually runs transversely across the anterior part of the abdomen bisecting the tubercles. In the middle line between the tubercles this shows an angle with its apex in front. This angle is nearly always present, and is sometimes the only part of the line which is not obliterated. The transverse line separates off the darker anterior part of the abdomen from the greyer or greener posterior part. The latter bears a dentated greyish or greenish leaf-like pattern, narrowing towards the spinners. *A. dromedarius* on the other hand is of a warm reddish brown, heather coloured hue. This I noted very distinctly on catching the specimens. The transverse white line on the anterior part of the abdomen is distinct and well defined. It shows a central angular projection like that of *A. gibbosus*. In front of the line the abdomen is of a dark reddish brown colour, showing a few white blotches and some smaller dark brown spots. The posterior part of the abdomen is reddish brown with many dark brown and a few yellowish brown spots. The dentated leaf-like pattern has white external margins. Transverse dark brown bands cross it from one side to the other. These diminish in breadth towards the spinners. Each is rather crescentic, the concavities of the crescents being in front. Laterally each runs forward, being in this way continuous with the band in front of it, and thus forming a lateral dark band inside the white margin of the pattern. A few white blotches are scattered over the parts of the abdomen external to the pattern. Beneath, the abdomen is of a very dark brown, the spinners and vulva being of the same hue.

The CEPHALOTHORAX is of a reddish brown colour, darkest at the sides, and covered with short hoary hairs. The central eyes form a trapezium very slightly broader in front than behind. Thorell* makes a great point of this as distinguishing the species from *Epeira bicornis* (Bl.), which is identical with *A. gibbosus*. He says that in *dromedarius* the area of the four central eyes is very

* Remarks on Synonyms of European Spiders, I., 22.

sloping, and that the figure they form is "in general somewhat broader in front," whilst in *bicornis* "it is exactly quadrate or even slightly broader behind." The difference in this respect is however very slight. If any ocular difference is needed it would be better to take the relation of the posterior centrals. In *gibbosus* these are much more than one diameter apart, whilst in *dromedarius* the interval is only one diameter or less. According to Westring† the central eyes *in each case* form an exactly quadrate figure, whilst the ocular area is in *gibbosus* black and very prominent, and in *dromedarius* reddish brown and low. These ocular arrangements are, however, of very slight importance compared with the great dissimilarity of the vulvæ of the two species. They may, however, be useful in dealing with immature specimens.

The LEGS are yellowish brown, very richly splashed and annulated with dark brown. The coxæ, trochanters, and patellæ are in particular very much suffused with brown.

The PALPI are coloured like the legs.

The VULVA is characteristic and very different from that of *A. gibbosus*. I here figure it. It must be, however, very like that of *Araneus Ulrichii* (Hahn), a species not yet found in Britain. This is figured by Dr. de Lessert‡. The species, however, appears to resemble *gibbosus* in the shape and direction of its abdominal tubercles. *Araneus dromedarius* (Walck.) has a wide continental range, occurring in France, the Channel Islands, Switzerland, Germany, Hungary, and Sweden. The Rev. O. P. Cambridge has seen and recognised my specimens.

Araneus Sturmii (Hahn). (Plate X., figs. 7–7d).

I have for some time been accumulating examples of *Epeira agalena* (Bl.) in the hope that amongst them I should find examples of *A. Sturmii* (Hahn) as well as *A. triguttatus* (Fabr.). Lately I carefully examined them all and

† Araneæ Suecicæ, pp. 44-47.

‡ Observations sur les Araignées du Bassin du Léman, Genève, 1904, pl. v., fig. 25.

found as I expected that both species were represented. In this Mr. Cambridge agrees with me. They can easily be distinguished, firstly by general facies and coloration, and secondly by the structure of the copulatory organs. Both species are carefully described and figured by Chyzer and Kulczynski*, and Bösenberg†. I here give a few comparative figures of both, because *A. Sturmii* is now for the first time recorded as British, and because I have discovered a difference in the palpal organs which is unnoted by earlier writers, and which renders the separation of the males as easy as that of the females. The differences in the facies and coloration are best marked in the females, and the following notes apply to that sex. In the males the same differences may exist, but are generally much less distinct, and they cannot be separated by facies alone. In the female sex both spiders are of about the same size, ranging in my examples from 4 mm. to 6 mm. In each there is a very slight prominence or hump on each side of the abdomen, such as occurs in a very much more developed condition in *A. gibbosus* (Walck.), where it forms a distinct tuberosity. This gibbosity is in both cases very slight, but it is a little more marked in *A. triguttatus* than in *A. Sturmii*. The abdomen of the former spider is therefore rather more angular than that of the latter, which is often nearly globular. The abdominal pattern is similar, but not quite the same in the two species. The prevailing colour in *triguttatus* is yellowish, with brown, usually dark brown, markings. A very broken and sometimes almost obsolete yellowish white line on each side of the anterior part of the abdomen cuts off obliquely a dull brown patch. These patches thus occupy respectively each side of the anterior part of the abdomen. Three or four similar, but not so deeply tinted patches occupy the dorsal surface on each side of the middle line. These grow smaller and nearer together as the spinners are approached. A central much branched yellowish brown stripe may also be present, but this is often obsolete.

* Araneæ Hungariæ, Tome 1, pp. 119, 126, 127, Tab. V., figs. 5, 6.

† Die Spinnen Deutschlands, pp. 38, 39, Taf. II., figs. 25, 26.

A. Sturmii on the other hand is a much greyer spider. Few examples show any yellow at all. The oblique lines on the fore part of the abdomen are nearly always conspicuous and white, not yellowish. The hinder part of the abdomen shows on each side a broken white dentated line. These lines converge towards the spinners, and their margins are bordered within by correspondingly indented greyish brown bands. The hinder part of the portion of the abdomen included by these lines is usually suffused with greyish brown. A branched central marking may be present, but I have not yet seen an example in which it was well developed.

The *males* of *triguttatus* are usually yellowish brown as to the abdomen, and of *Sturmii* greyish brown. In either case the abdomen may be quite without any pattern, but frequently *triguttatus* bears three large yellow macules at the anterior part, and *Sturmii* a dentated pattern on the posterior part.

The *females* are very easily distinguished by the vulvæ, which I here figure (see plate). Drawings are much more useful than descriptions in this connection.

The male palpi are figured by Chyzer and Kulczynski, and Bösenberg. They draw their distinctions from a dentigerous process placed on the inner side of the palpal organs. This is a fairly good but variable distinction, and the difference after all is only one of degree. There is, however, an excellent difference in the palpal organs. This is best seen from the inner side, but is also visible from above. It is difficult to describe, so I give figures showing its position amongst the processes of the palpal organs, and also others showing its details of structure. I think it will be found useful, and when once it is appreciated the males can be easily distinguished. The whole palpal organs and tarsus are distinctly larger and bulkier in *A. Sturmii* than in *A. triguttatus*. I believe that Blackwall* possessed both species, which he included under the name of *Epeira agalena* (Bl.). I think his descriptions of the abdomen refer to *A. Sturmii*, and those of the sexual

* Spiders of Great Britain and Ireland, p. 334, pl. xxiv., fig. 242.

organs of both male and female to *triguttatus*. In his figures I think the male is drawn from *Sturmii*, and the female from *triguttatus*. He does not figure the vulva, and one of his drawings of the palpus is useless. The other one, 242f., is, however, most certainly that of *A. triguttatus*, and in it he shows fairly accurately the critical part which I also figure. Unfortunately this figure is by error assigned to *E. sollers* (Walck.), the next spider on the plate. This mistake, however, is partly rectified in the explanation on the opposite page.

I have obtained *Araneus triguttatus* (Fabr.) in Devon, Dorset, and Essex (Epping.) I have never seen it from the north of England, the specimens so recorded by me† from Hexham being really *Sturmii*. *Araneus Sturmii* (Hahn) I have found in Northumberland, Cheshire (Delamere) and the New Forest. Both species are obtained by beating, but while *triguttatus* occurs usually upon gorse bushes, shrubs, and deciduous trees, *Sturmii* is found upon Scotch firs and spruces‡.

Both species have a wide continental distribution, *Sturmii* being found in France, Germany, Switzerland, and Hungary at all events.

Prosthesima latitans (L. Koch). (Plate X., figs. 11, 11a).

On May 31st Mr. Wallis Kew showed me a flint pit at West Wickham near Bromley in Kent, where Prosthesimæ abounded. These turned out to be *P. pedestris* (C. L. Koch), *P. Latreillii* (C. L. Koch), and the present spider. Of the last we got two adult males and four immature females. The females had not properly developed vulvæ, but each epigynal area was quite unlike that of any other British species. Underneath the thick white integument it was possible to trace the epigyne of the present spider. The males were adult and typical, and I here figure the palpus, as there is no

† Spiders of Tynedale. Trans. Nat. Hist. Soc. Northumberland, Durham, and Newcastle-upon-Tyne. New Series. Vol. i., p. 396.

‡ Compare R. de Lessert. Observations sur les Araignées du Bassin du Léman, Genève, 1904, p. 366.

figure in British literature of that organ. *P. latitans* (L. Koch) is rather smaller than *P. Latreillii* (C. L. K.) or *P. Petiverii* (Scop.). It is of a deep uniform black, except the tarsi which are yellow. The central posterior eyes are much less than one diameter apart, whereas they are separated in the aforesaid spiders by a space much greater than the diameter of one of them. The palpi are very characteristic, and the males of this species can easily be distinguished from their congeners by the curved spine which, rising at the base of the palpal organs, runs round their external border and terminates near the apex at the inner side. The tarsi and palpal organs are bulkier than in the other species, and the tibial apophysis is rather different in shape from that of *P. Petiverii* (Scop.), which it most resembles in that respect. We did not get adult females, but the vulva is well figured by F. O. Pickard-Cambridge*.

P. latitans had previously occurred in Dorset alone as far as Britain is concerned. Chyzer and Kulczynski maintain† that *P. latitans* (L. Koch) is identical with *P. præfica* (L. Koch), and that the latter name has priority. *P. latitans* (L. Koch) has occurred in France, Switzerland, Germany, and Hungary.

Prosthesima Petiverii (Scop.-Camb.). This is a common English spider. I sent a few specimens to Professor Kulczynski for his opinion. He states that they are identical with the *P. apricorum* (L. Koch) as figured in "Araneæ Hungariæ." He now believes however that *apricorum* is only a variety of *P. subterranea* (C. L. Koch), which is synonymous with our *P. Petiverii* (Scop.).

Prosthesima pedestris (C. L. Koch). Both sexes at West Wickham. Also a pair in cop. under a stone at Swanage on June 9th.

* Handbook to the Study of British Spiders, pl. iv., fig. 6.

† Araneæ Hungariæ, Tome II., part ii., p. 202.

Prosthesima nigrita (Fabr.). An adult male amongst coarse grass in Richmond Park.

Prosthesima longipes (C. L. Koch). A female at Studland in June. Mr. Cambridge saw and identified the specimen, whilst Professor Kulczynski, who also saw it, states that it is identical with the female of *P. serotina* (L. Koch) as figured by him in the "Araneæ Hungariæ."

Drassodes pubescens (Thor.). Several males amongst starr grass on the sandhills at Studland on June 10th.

Drassodes sylvestris (Bl.). One female at Burnham Beeches, May 30th.

Gnaphosa lugubris (C. L. Koch). Both sexes under stones on the undercliff at Durleston Head, Swanage.

Clubiona neglecta (Camb.). One male on Studland sandhills.

Clubiona subtilis (L. Koch). Both sexes were frequent amongst starr grass on the Studland sandhills.

Liocranum domesticum (Wid.). One adult female and many immature examples under stones at Swanage on June 9th.

Micrommata virescens (Clerck). An adult female was sent to me by Mr. W. P. Winter. It was captured at Grass Woods, Grassington, Yorkshire. This is the first specimen I have seen from the North of England.

Thomisus onustus (Walck.). A male was swept from heather in the New Forest, and another was obtained in the same way on Bloxworth Heath. Both captures were made in early June.

Diæa dorsata (Fabr.) Both sexes were beaten from oak trees in the New Forest during the first week in June.

Philodromus margaritatus (Clerck). An immature individual from the New Forest.

Philodromus emarginatus (Schranck). I beat examples of this spider from Scotch firs near Beaulieu Road Station

in the New Forest in early June. Mr. Pack-Beresford also sent me a fine female obtained on Devenish Island, Lough Erne, Ireland, by Mr. R. Welch.

Philodromus elegans (Blackw.). Several examples—all females—of this extremely beautiful spider were swept from long heather on the summit of Woolbarrow, Bloxworth Heath in early June.

Euophrys petrensis (C. L. Koch). Females on a sandy path on Bloxworth Heath.

Evarcha arcuata (Clerck). Both sexes amongst heather growing in boggy places at Burnham Beeches, and in the New Forest.

Sitticus pubescens (Fabr.). A female on the trunk of a tree in Richmond Park, another on a pear tree in my garden at Chester, and a young male on the ceiling of a bedroom in my house.

Ælurillus insignitus (Clerck). Both sexes amongst heather at Studland.

Cicurina cinerea (Panz.). Females under stones in a chalk pit at Cudham, Kent.

Cœlotes terrestris (Wid.). Females in company with the last species.

Dolomedes fimbriatus (Walck.). Both sexes were found in the adult condition at Hyde near Bloxworth in early June. They inhabited the steep sides of a ditch overhung with heather. They were in considerable numbers, but unfortunately I was not prepared for much 'big game,' and so could only take a few specimens.

Trochosa robusta (Sim.). Females and young under stones at Swanage.

Tarentula cuneata (Clerck). The males were not uncommon running on the paths in Richmond Park on June 1st. No females could be found in spite of much search.

Lycosa proxima (C. L. Koch). Both sexes in the New Forest in June.

Crossopriza Lyoni (Bl.). (Family Pholcidæ). Mr. W. Evans sent me a male which I believe to be of this species in the early part of 1908. He had found it commonly at Leith in the hold of a ship recently arrived from Rangoon. It has of course no place in our fauna, and is not even acclimatized, but its capture is interesting, as our own *Pholcus phalangioides* is probably a recent introduction, and perhaps came over from the Continent in a similar manner.

Theridion lepidum (Walck.). Both sexes in the swamp at Hyde. June.

Theridion aulicum (C. L. Koch). Studland, where both sexes occurred on gorse bushes in company with numerous examples of the commoner Theridions.

Lithyphantes corollatus (Linn.). Females were found amongst heather on Bloxworth Heath in June.

Enoplognatha thoracica (Hahn). Obtained at Cudham, Richmond Park, and Studland.

Robertus arundinetus (Camb.). Females were obtained under stones on Wan Fell near Penrith by Mr. Britten. April.

Robertus neglectus (Camb.). Two males from Great Salkeld near Penrith by Mr. Britten.

Ceratinella scabrosa (Camb.). A pair were found in a marshy place at Brockenhurst in the New Forest.

Baryphyma pratensis (Bl.). Females from Chester in May, and both sexes from the banks of the Eden in Cumberland in the same month. Mr. Britten.

Panamomops bicuspis (Camb.). Both sexes from Chester, and a male from Penrith in Cumberland.

Metopobactrus prominulus (Camb.). This widespread but rather rare spider turned up at Cudham, Studland, and Bloxworth during the past year.

Entelecara Thorellii (Westr.). Mr. Britten obtained a male by sweeping at Newton Moss, Penrith, about the end of May.

Entelecara Jacksonii (Camb.). A single male, also found by Mr. Britten, occurred amongst wet moss at Wan Fell near Penrith. Glamorganshire and Cheshire were the only counties for which it was previously recorded.

Thyreosthenius biovatus (Camb.). Mr. H. Britten found females at Keswick in the nests of *Formica rufa*.

Evansia merens (Camb.). An adult male was sent to me by Mr. D. R. Pack-Beresford. He found it on Howth Head in a locality much infested with ants, but the spider was not actually within a nest.

Wideria melanocephala (Camb.). Both sexes amongst dead leaves in the New Forest, June.

Wideria fugax (Camb.). A male in a similar situation at Burnham Beeches at the end of May.

Gongylidiellum murcidum (Sim.). Several males and one female in a marshy spot in the New Forest. Mr. Cambridge obtained specimens in the same place many years ago.

Hillhousia miser (Camb.). A male from Wan Fell, Penrith, Mr. Britten.

Macrargus firmus (Camb.). Mr. Britten found a female amongst moss near Keswick.

Bathyphantes setiger (F. Camb.). A male from Newton Moss on May 31st. This spider does not turn up elsewhere.

Leptyphantes angulatus (Camb.). A female captured on the summit of Bowfell, Cumberland, in August, 1903. The altitude is about 2,960 feet. I was unable to recognise the species until this year, when the Rev. J. E. Hull sent me a pair of adults captured by him in Northumberland. The identity of my female was then

apparent. I thought, however, that *L. angulatus* (Camb.) might be identical with some of the continental species figured in several of Professor Kulczynski's papers. I therefore sent Mr. Hull's examples to that arachnologist. He informed me, however, that our species is quite different from any of its allies with which he is acquainted.

Leptyphantes pallidus (Camb.). A fine gynandrous form occurred near Cudham at the end of May. In this specimen the right palpus was of the male form with well developed palpal organs. The left palpus was of the female type. The epigyne was large but assymetrical. The central portion was of the normal female type, and so was the left part of the scapus. The right portion of the scapus was quite short. Thus the specimen was male on the right side, and female on the left. This is the third gynandrous spider I have seen. The others were *Hilaira excisa* (Camb.) and *Porrhomma oblongum* (Camb.). All these are rather closely related, belonging to the sub-family Linyphiinæ, of the family Argiopidæ.

Linyphia impigra (Camb.). Females amongst herbage in the swamp at Hyde near Bloxworth.

Eugnatha striata (L. Koch). An immature male was sent to me by Mr. Pack-Beresford. This had been found by Mr. J. N. Halbert, at Ballysadare, County Sligo, in 1901, and had been lying ever since in the Dublin Museum. Its facies is very characteristic, and the arrangement of its eyes easily separates it from the Tetragnathæ.

Singa albovittata (Westr.). Females swept from heather in the New Forest and at Bloxworth. The snare of this little spider is spun very close to the ground, and I fancy it is commoner than the results obtained from sweeping would imply.

Singa sanguinea (C. L. Koch). A pair swept from heather in the New Forest, and an adult male a day or two later on Bloxworth Heath.

Singa hamata (Clerck). A colony amongst long heather growing in a swamp in the New Forest.

Cercidia prominens (Westr.). Two females amongst low herbage at Cudham, Kent, on May 31st.

Mangora acalypha (Westr.). Swept from heather at Burnham Beeches, Hayes (Kent), New Forest, and Bloxworth.

Araneus angulatus (Clerck). New Forest, May. No adults were, however, found.

Araneus dioideus (Walck.). Not rare in the New Forest and Dorset. A female was also sent to me from Ross in Herefordshire.

Theridiosoma argenteolum (Camb.). I found this little spider in the New Forest, and at Morden Park near Bloxworth. It spins a beautiful little geometric snare, as described by McCook* for a similar (or identical) species. The spider inhabits swampy ground, or damp ditches, and the snare is placed very near the ground, or even in depressions such as the footprints of cattle. The angle of the snare may vary from the vertical to the horizontal positions. A guide line leaves the centre of the snare and runs to some fixed point outside it. By pulling on this the spider is able to convert the snare from a plane surface into a conical cul-de-sac, and according to McCook the American species entangles its partly trapped prey by letting go suddenly after the manner of *Hyptiotes*. This act I did not observe myself, and in fact observations having to be made kneeling or lying in an inch or two of water are not very easy. The spider may be found either outside its snare on the guide line, or seated in the centre of the circular web. Both sexes

* American Spiders and their Spinning Work, vol. i., pp. 195–207.

are to be found in snares. The centre of the snare is usually very irregular, but this varies a good deal. The periphery, and in fact the major part of the web is regular, and the spiral is studded with viscid globules, as in the related Epeiræ and Tetragnathæ. The snares of this animal have not previously been observed in Britain, and it is not yet certain that the species is identical with either the Continental or the American form.

Dictyna pusilla (Westr.). Burnham Beeches. New Forest. Only one or two examples in each locality.

Dictyna variabilis (C. L. Koch). A pair were obtained in the New Forest.

Protadia patula (Sim.) An immature but fully grown male was found at Saltney Ferry on the Dee amongst water-borne debris on November 1st.

Order OPILIONES

Sclerosoma quadridentatum (Cuv.).

Sclerosoma romanum (L. Koch).

Professor Kulczynski informs me that he considers the latter animal merely the young of the former. I think this is very likely, though it had never struck me before. On May 31st I found eight or ten specimens in a tuft of long grass at Cudham. Of these there were one or two undoubted examples of *quadridentatum*, the others were smaller, some very small, and were what have been called *romanum* in the past. Amongst some specimens found at Sidmouth in 1907 the same thing was noticed. More investigations are of course necessary, but I think Prof. Kulczynski's view will be found correct.

Oligolophus Meadii (Camb.). Two males and a female under stones on the shore at Burton Point near the Dee Estuary in Cheshire, October.

Order PSEUDOSCORPIONES

Chthonius Rayii (L. Koch). I have found this animal amongst dead leaves at Burnham Beeches, Cudham, and Chester. It also occurred under stones at Swanage, and amongst bat's dung in a cave at Cefn in North Wales.

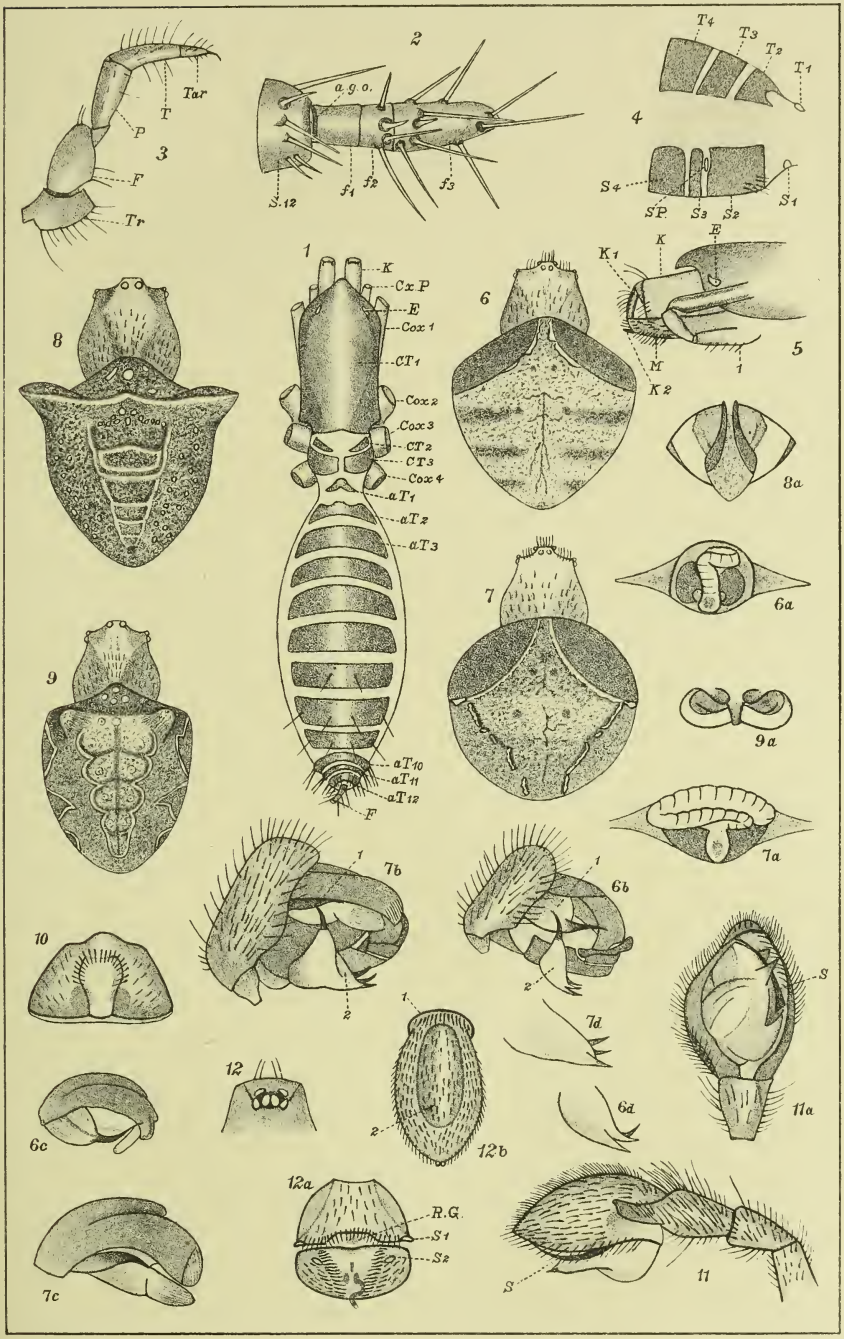
Chthonius tenuis (L. Koch). Frequent amongst moss and dried leaves in the New Forest. It was much commoner there than the ubiquitous *Obisum muscorum* (Leach) which also occurred. Both species also turned up at Bloxworth.

Chernes cyrneus (L. Koch). Mr. Wallis Kew most kindly took me to the tree in Richmond Park inhabited by this species. We found several examples; they were not so hard to find as was the tree.

Order PEDIPALPI

Trithyreus Bagnallii (Jackson). (Plate X., figs. 1–5). I described this animal in a previous paper,* and here give figures. Several females have been found at Kew since my communication, but unfortunately no males. The present species is distinguished from all other Tartarids except one by the presence of distinct eyes, each with a convex vitreous cornea. From *T. Cambridgii* (T. Thor.) it may be separated by the shape of the eyes, which in *Cambridgii* is round and more convex, in the present form irregularly oval and less so. *T. Bagnallii* also has the fourth femora only twice as long as broad; in *T. Cambridgii* they are slenderer, the length being two and a half times the breadth. The shape of the palpal trochanter is rather different also in the two species. In the present figures I illustrate most of these points. The example figured measured 3·1 mm. in length, exclusive of the flagellum.

* Trans. Nat. Hist. Soc. Northd., Durham, and Newcastle-on-Tyne, New Series, vol. iii., part 1, pp. 28, 29, 30.



A. Randell Jackson del.

W. West lith.

RARE ARACHNIDS.

EXPLANATION OF PLATE X.

1. Trithyreus Bagnallii (Jackson). Female from above. Appendages amputated at the coxa.
E, eye. CT_1, CT_2, CT_3, tergites of the cephalothorax. aT_1–aT_{12} abdominal tergites. F, flagellum. K, basal joint of falx. $Cox._1$–Cox_4, coxæ. CxP, palpal coxa.

2. ,, ,, Flagellum in profile.
f_1, f_2. f_3 the three joints. S_{12} the 12th segment. a. g. o. aperture of one of the glandulæ odoriferæ.

3. ,, ,, Right palpus in profile.
Tr, trochanter. F, femur. P, patella. T, tibia. Tar., tarsus.

4. ,, ,, Anterior part of the abdomen from the right side.
T_1–T_4 first four abdominal tergites. S_1–S_4, first four abdominal stermites. SP, spiracle of right side.

5. ,, ,, Anterior part of cephalothorax from left side.
E, eye. K, falx. K_1 movable finger of falx, K_2 fixed finger of falx. M, maxilla. 1, first leg.

6. Araneus triguttatus (Fabr.). Female with appendages removed, showing abdominal pattern.

6a. ,, ,, Vulva of female from below.

6b. ,, ,, Right palpus of male from inner side.

6c. ,, ,, Detailed view of 1 on 6 b.

6d. ,, ,, Detailed view of 2 on 6 b.

7. Araneus Sturmii (Hahn), Female from above, showing abdominal pattern.

7a. ,, ,, Vulva of female from below

7b. ,, ,, Right palpus of male from inner side.

7c. ,, ,, Detailed view of 1 on 7 b.

7d. ,, ,, Detailed view of 2 on 7 b.

8. Araneus dromedarius (Walck.). Female from above, showing abdominal pattern. Appendages removed.

8a. ,, ,, Vulva from below.

9. Araneus gibbosus (Walck.). Female from above, showing abdominal pattern.

9a. ,, ,, Vulva of female from below.

10. Cornicularia valida (sp. nov.) Vulva of female from below.

11. Prosthesima latitans (L. Koch). Left palpus of male from outer side. S, characteristic spine.

11a. ,, ,, Left palpal organs from below. S, characteristic spine.

12. Triæris stenaspis (E. Simon). Ocular area of female from above.

12a. ,, ,, Anterior part of abdomen of female from below. RG, rima genitatis. S_1 S_2, spiracles.

12b. ,, ,, Abdomen of female from above. 1, epigastric scutum. 2, dorsal scutum.

Trematodes of the Northumberland Coast, No. III.—A Preliminary Note on Echinostephilla virgula, *a new Trematode in the Turnstone.* By MARIE V. LEBOUR, M.Sc., Assistant Demonstrator in Zoology, Leeds University.

(With Plate XI.)

The following is a brief account of an apparently new Trematode from the intestine of the Turnstone *Arenaria interpres*. The birds were shot at Beadnell on the Northumberland coast, where they are winter visitants. Their stomachs usually contain small marine Crustacea (chiefly Isopoda), insect larvæ, and Mollusca (*Littorina rudis*, *Paludestrina stagnalis*, etc.). A dozen birds were examined at different times, three of which contained the Trematode about to be described. Not more than two specimens occurred in each bird, and some were dead and in a bad condition for examination.

This was by no means the only worm parasite in the intestine of the Turnstone, for numerous Cestodes were present, and three other Trematodes were found, including *Echinostomum leptosomum* Creplin, and *Monostomum petasatum* Desl., the latter in the intestinal cœca.

This new Trematode is found from about the middle of the intestine to near the terminal part, and is usually associated with Cestodes, from which at first sight it is with difficulty distinguished, as it has the same peculiar opaque, cream-white appearance. The live specimens were killed with corrosive sublimate and preserved in alcohol, afterwards being examined in oil of cloves as pressure preparations. In this way the details of the female reproductive system could not be exactly made out, but enough of the structure of the worm was seen to show that it is almost certainly a new genus and species, and for it I propose the name *Echinostephilla virgula*.

The worm is long and narrow, and, when living, almost invariably curved up at the posterior end and looking much

like a comma. (The drawing shows a straightened preparation.) The length varies from 4 to 8 mm. All the measurements here given are taken from a specimen 4·5 mm. in length. The body is broadly rounded at the anterior end and tapers to a point posteriorly. The greatest breadth is in the region of the ventral sucker, where it measures 0·6 mm. The front end is slightly marked off from the rest of the body by a neck which is situated about 0·16 mm. from the anterior end. The body is flattened dorso-ventrally, particularly in the region between the two suckers, where it is peculiarly concave ventrally.

The suckers are both strongly muscular and are circular, with circular apertures. The oral sucker is much the smaller, being only 0·12 mm. in diameter, with an aperture of 0·08 mm., and is situated at the extreme anterior end. The ventral sucker is large, measuring 0·40 mm. across. It occurs at about the anterior fifth of the body.

The worm is very tough, with a thick cuticle, armed with sharply pointed spines, which gradually broaden as they reach the centre of the body, and become more leaf-shaped. The spines begin a short way below the neck, running all round in rows, and arranged in quincunx order so as to give the appearance of oblique striation (see plate xi., fig. 1). Each spine measures about 0·01 mm. in length. Posterior to the ventral sucker they thin out and are scattered more irregularly, soon disappearing except at the sides, where they become farther apart until the distance between the spines is twice as great as in the fore part of the body. At the last seventh of the body they disappear altogether. The spines originate on the inner surface of the cuticle, and are arranged obliquely with their apices directed backwards; only the points reach the surface. As they thin out posteriorly they are entirely within the cuticle.

The head is completely surrounded by a crown of two rows of blunt spines measuring about 0·008 mm. in length and closely set together. The exact number was not ascertained,

but, roughly speaking, there appeared to be about 56 in each row. Each spine in the anterior row is placed exactly in front of the corresponding spine in the posterior row, and does not alternate with it.

The oral sucker leads to a short prepharynx 0·10 mm. long, and a muscular pharynx slightly longer than it is broad. From this runs a long narrow œsophagus 0·30 mm. long, branching a short way in front of the ventral sucker into two narrow lobes reaching the posterior end about 0·60 mm. from its termination.

The excretory vesicle is a long narrow sac running forward and reaching beyond the posterior testis. It gives off lateral branches which divide continually in the anterior part of the body in a sort of network of ducts running out horizontally from the laterals, which terminate in a single curved tube on each side of the oral sucker.

The genital pore occurs in the median plane just anterior to the ventral sucker and below the fork of the intestine, the male and female ducts opening side by side, the male on the right and the female on the left.

The testes are two oval bodies situated one in front of the other in the posterior part of the body about 2·4 mm. from the end. They are closely apposed, the front testis being slightly larger than the other, the measurements of their long axes, which lie longitudinally, being 0·24 mm. and 0·20 mm. respectively. The vasa deferentia run up to a long narrow cirrus sac which extends about 0·60 mm. beyond the ventral sucker.

The cirrus sac makes one or two bends, so that it has rather a twisted appearance. The portion behind the ventral sucker is occupied by the vesicula seminalis, and anterior to this is a long cirrus. No pars prostatica was observed. The cirrus sac runs dorsal to the ventral sucker, and opens ventrally by the side of the vagina. The cirrus is extremely long, and is usually exserted for about half its length. It has the form of a long narrow tube with a thick wall, the inside of

the tube being lined with fine spines with their apices directed forwards. These spines are not continued into the anterior part of the cirrus and are never exserted, so they probably serve the purpose, as Stossich* suggests in the case of *Stephanochasmus pristis* Desl., of preventing the sperms from going back after leaving the body.

The ovary is situated in front of the foremost testis, and is separated from it by a space of about 0·12 mm. It corresponds in shape and size with the larger testis. The uterus, full of eggs, winds behind the ovary, and then turns and twists in many loops in front, filling up the middle part of the body nearly as far as the vesicula seminalis. Here it dilates and runs forwards as a muscular vagina, which opens into the genital pore by a thick lip. No receptaculum seminis was observed. The vitellaria are not strongly developed, and consist of two thin bands of small spherules running along each side of the body close to the intestinal lobes, beginning in front of the posterior part of the testes, and ending at about the level of the central part of the vesicula seminalis. A transverse duct from each side unites with its fellow in a vitellarian receptacle just behind the ovary.

The ova are numerous, measuring 0·10 mm. × 0·05 mm., each end being rounded equally. They are coated with thick yellow shells, and in the anterior half of the uterus have developed into miracidia with a conspicuous eye-spot. Near the genital pore the shells are empty, the miracidia having perhaps escaped. Empty shells were seen in the oral sucker.

This Trematode almost certainly belongs to the sub-family *Echinostominæ* Looss, although differing from all the hitherto-known genera in the presence of miracidia in the eggs and in the weakly developed vitellaria, which do not extend into the posterior region of the body behind the testes. In these respects it resembles *Parorchis* Nicoll,† and in the presence of miracidia it resembles the sub-family *Philophthalminæ* Looss.

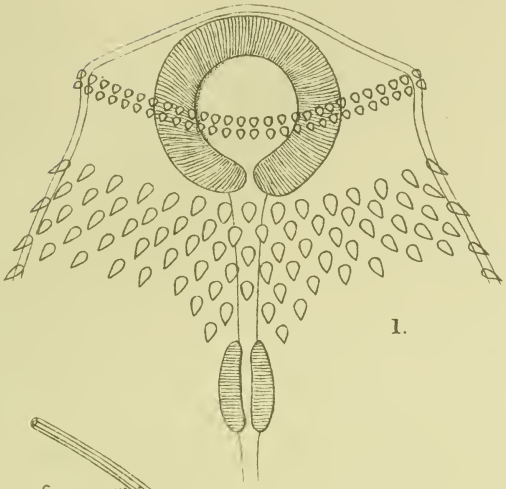
* Stossich, M., "Brani di Elmintol. Tergestina III.," Bol. Soc. Ad. Trieste IX., 1886.

† Nicholl, W., "Parorchis acanthus, the type of a new Genus of Trematodes," Quart. Journ. Mic. Sci., vol. 51, part ii., 1907.

Besides the above-mentioned characters it differs from *Echinostomum* and *Stephanochasmus* in its very much thicker build and blunt head spines.

The genus *Echinostephilla* may be thus briefly described:—

Echinostephilla n.g. Medium-sized worm with long and narrow body, broadly rounded anteriorly and pointed posteriorly, flattened dorso-ventrally. Suckers approximated, strongly developed. Oral very small, and ventral large. Body armed with a thick cuticle, covered with spines except at the posterior end. Head armed with two complete rows of numerous flat blunt spines arranged one directly in front of the other. Prepharynx, pharynx, and fairly long œsophagus. Intestinal lobes reaching nearly to the posterior end of the body. Excretory vesicle long and narrow, vessels very much branched anteriorly. Genital pore median, between ventral sucker and fork of intestine. Testes oval, one behind the other and close together, in posterior third of body. Cirrus sac long and narrow, reaching some way behind the ventral sucker, containing simple vesicula seminalis and long cirrus, the latter armed internally with spines and protrusible for the greater part of its length. Ovary in front of testes, uterus long and winding, containing numerous eggs, the most advanced being in the miracidium stage with eye-spot. Vagina long, winding, and muscular. Receptaculum seminis (?), Laurer's canal (?). Vitellaria weakly developed, reaching from posterior testis to near middle of vesicula seminalis. Type, *Echinostephilla virgula*.



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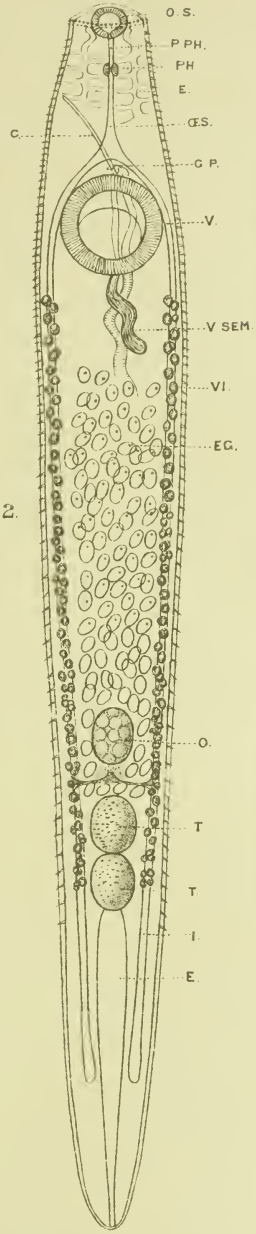

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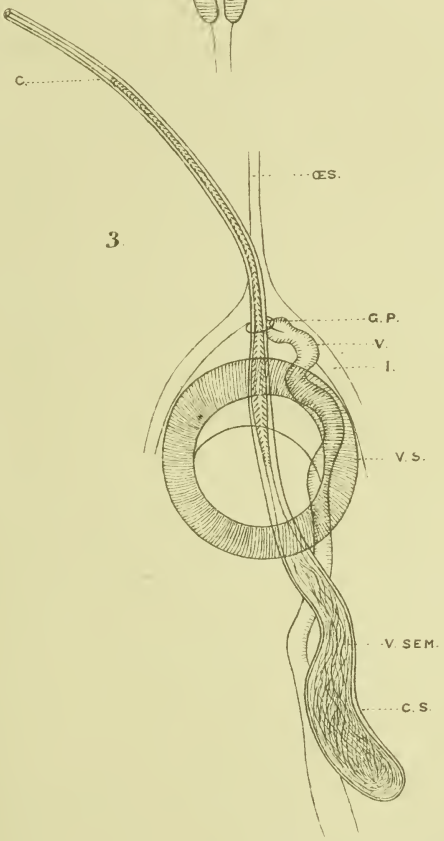


3.

M V Lebour del

W West lith.

STREPSORCHIS VIRGULA.

EXPLANATION OF PLATE XI.

NOTE :—At the time when the plate was being lithographed it was proposed to name the genus *Strepsorchis*, and this name appears on the plate instead of *Echinostephilla*.

Fig. 1.—Head and fore part of body of *Echinostephilla virgula*. (For the sake of clearness the spines of the body are shown less numerous than they really are.)

Fig. 2.—*Echinostephilla virgula*—ventral view.

Fig. 3.—Region of genital pore of *Echinostephilla virgula*.

O. S.	oral sucker	V. S.	ventral sucker
P. PH.	prepharynx	V. SEM.	vesicula seminalis
PH.	pharynx	VI.	vitellaria
E.	excretory system	EG.	eggs
ŒS	œsophagus	O.	ovary
G. P.	genital pore	T.	testes
I.	intestine	C.	cirrus
V.	vagina	C. S.	cirrus sac

Notes on Spiders

By the Rev. J. E. Hull, M.A.

(With Plate XII.)

In the following notes of recent captures four species (marked with an asterisk in the list below) are now recorded for the first time for Northumberland, bringing the county total up to 293. It is a great satisfaction to be able to correct a mistake made in my last year's paper on "Allendale Spiders" with regard to the female of the new species *Hilaira pervicax*.

Prosthesima nigrita Fabr. In considerable number on the sandhills north and south of North Sunderland in September, 1908; all immature, of course, at that period. Taken by Dr. Hardy in the Wooler district in 1871.

Bolyphantes expunctus Cb. I have received, among other spiders collected in the neighbourhood of the Moray Firth in August, 1908, an adult pair of this interesting species. This is, I think, the fourth record for Scotland. It has not been met with elsewhere in the British Isles, and the only Continental record is for Hungary. It is much smaller than its congeners, measuring barely 2 mm. in length; nor does the male possess the characteristic thickened spine of the palpal patella which distinguishes *B. alticeps* and *B. luteolus*, the spine in *B. expunctus* being exactly similar to that of *Leptyphantes angulatus*, Cb. It would appear that this species attains maturity towards the end of August, for some examples were taken which had not yet undergone their final moult. As no British figures of the male have been published, I now supply them.

Leptyphantes flavipes Bl. Probably a commoner species than is generally supposed. I have taken it in several places in West Allen, and have received it from Coquetdale and from Middlesbrough.

Leptyphantes angulatus Cb. Northumberland can no longer boast a monopoly of this spider. Dr. Jackson very kindly let me see an adult female, taken by him on Bow Fell, Cumberland, in 1903, which is certainly of this species.

***Porrhomma errans** Bl. From time to time adult males have occurred in my garden at Ninebanks, but by an oversight the species has not hitherto been added to the Northumberland list.

Hilaira pervicax Hull. The first genuine female of this species was taken in October, 1908. Early in November males and females were found together in considerable numbers, finally establishing the identity of the female. A month later the males were greatly diminished in number, the females as numerous as before. Figures and descriptions of the latter sex are given below.

Hilaira uncata Cb. Much less common than *H. excisa* in Allendale, and affecting less sheltered situations.

Centromerus arcanus Cb. Abundant under junipers at Carshield in West Allen, and ascending to the top of Killhope.

***Centromerus probabilis** Cb. Under this name the Rev. O. Pickard-Cambridge figures and describes (Proc. Dorset N. H. and A. F. Club, vol. xxix., p. 190) a female spider which I sent to him early in 1907. It was found among stones and moss on a "dead-heap" adjoining the garden at Ninebanks Vicarage, where I have searched diligently for further examples without success.

Micronetа beata Cb. Recognized as a distinct species so recently as 1906, and yet by no means uncommon. It is pretty frequent in my garden at Ninebanks and elsewhere in West Allen. It has also been sent to me from Cresswell and Greatham.

Micronetа cauta Cb. A spider which I take to be of this species occurs pretty commonly in moss on the Allendale

fells. It was also taken in Dipton woods at the Field Meeting in June, 1909.

Sintula fausta Cb. This is one of the very few species which may be met with in the marshy places on the open fells. I have taken both sexes up to 1,500 feet.

Erigone promiscua Cb. Both sexes, Ninebanks, May, 1909.

Gongylidiellum latebricola Cb. West Allen, but very rare; females only.

Diplocephalus picinus Bl. By far the rarest of the six species found in Allendale. *D. beckii*, Cb., is comparatively common, especially under loose bark on fallen trees, where both sexes may be found together in April. The female of *D. picinus* has not been figured in any British work. The epigyne is now figured with that of *Savignia frontata* Bl., which closely resembles it under a lens of low power.

Tapinocyba insecta L. K. Ninebanks, a single female among grass on the open fell in May.

***Cnephalocotes elegans** Cb. Whitfield Fell, at 1,400 feet; a single male. Both sexes from the sandhills at Cresswell, Mr. W. Flowers.

***Cnephalocotes incurvatus** Cb. Two adult males, North Sunderland, September, 1908. A most interesting addition to the fauna of the county. Up to this time the original type specimen—also a male—was unique. It was sent to the Rev. O. Pickard-Cambridge from Aberdeen over thirty years ago (Trans. Linn. Soc., xxviii., p. 551; sub *Walckenaera incurvata*). The female is therefore still unknown, but careful collecting on the Northumbrian coast ought to bring it to light.

Lophocarenum nemorale Bl. North Sunderland, September, 1908, among tidal drift. In company with it were *Lophocarenum parallelum*, Bl., *Erigone longipalpis*, Sund., and *Erigone arctica*, White. From the same

spot, a month later, Mrs. Fletcher, of North Sunderland Vicarage, sent me a fine pair of *Typhochraestus digitatus*, Cb., of which species the male had not previously been taken in the county.

L. nemorale was first taken in Northumberland by Dr. Hardy on Cheviot Hill in 1871. I have recently taken a few examples of both sexes in West Allen at 1,300 feet and upwards. *L. parallelum* appears to stop at about 800 feet. Figures of the females of these two species (also of *Cnephalocotes incurvatus* ♂) are given in my paper on 'Northumbrian Coast Spiders' in the 'Naturalist,' August, 1909.

Caledonia evansii Cb. Ninebanks, December, 1908, among grass. One of the latest additions to my Allendale list, which now (June, 1909) numbers 185 species.

Thyreosthenius biovatus Cb. A male and three females were taken from a nest of *Formica rufa* on the occasion of the Field Meeting at Dipton woods in June, 1909.

Evansia merens Cb. This spider is probably to be met with anywhere in the low-lying parts of Northumberland and Durham in the nests of *Lasius niger* or *Formica fusca*, but in Allendale I have only once taken it, from the nest of the former. In Cleveland, however, at similar elevations it seems to be quite plentiful, for I have received it in considerable numbers from my nephew, Mr. J. W. H. Harrison, of Middlesbrough, who has found it on both sides of the Tees with both species of ant.

Cornicularia vigilax Bl. An adult male, Whitfield Fell, May, 1909.

HILAIRA Simon

Hilaira pervicax Hull

H. pervicax, sp. n., J. E. Hull, Trans. Nat. Hist. Soc. Northd., etc., new ser., vol. iii., 1908, p. 112; male, not female.

H. pervicax, Hull-Camb., Proc. Dorset N. H. and A. F. Club, 1908, p. 173; male, not female.

?Erigone consimilis, Camb., Proc. Zool. Soc., Lond., 1875, p. 192.

The probability of the identity of *H. pervicax* with *H. (Erigone) consimilis*, Cb., has only very recently been suggested to me by Mr. Pickard-Cambridge. The original type of *H. consimilis* is still in the British Museum, and the question will be settled as soon as the necessary comparison can be made. The spider described by me in last year's proceedings as the female of *H. pervicax* is without any doubt *H. excisa*. The description of the true female, which I have since taken in considerable numbers, is as follows :—

Total length from 2·6 mm. to 3·1 mm.

Cephalothorax 1 mm. to 1·3 mm. Greatest depth (at occiput) hardly less than half this length. Clypeus about equal to the ocular space in height.

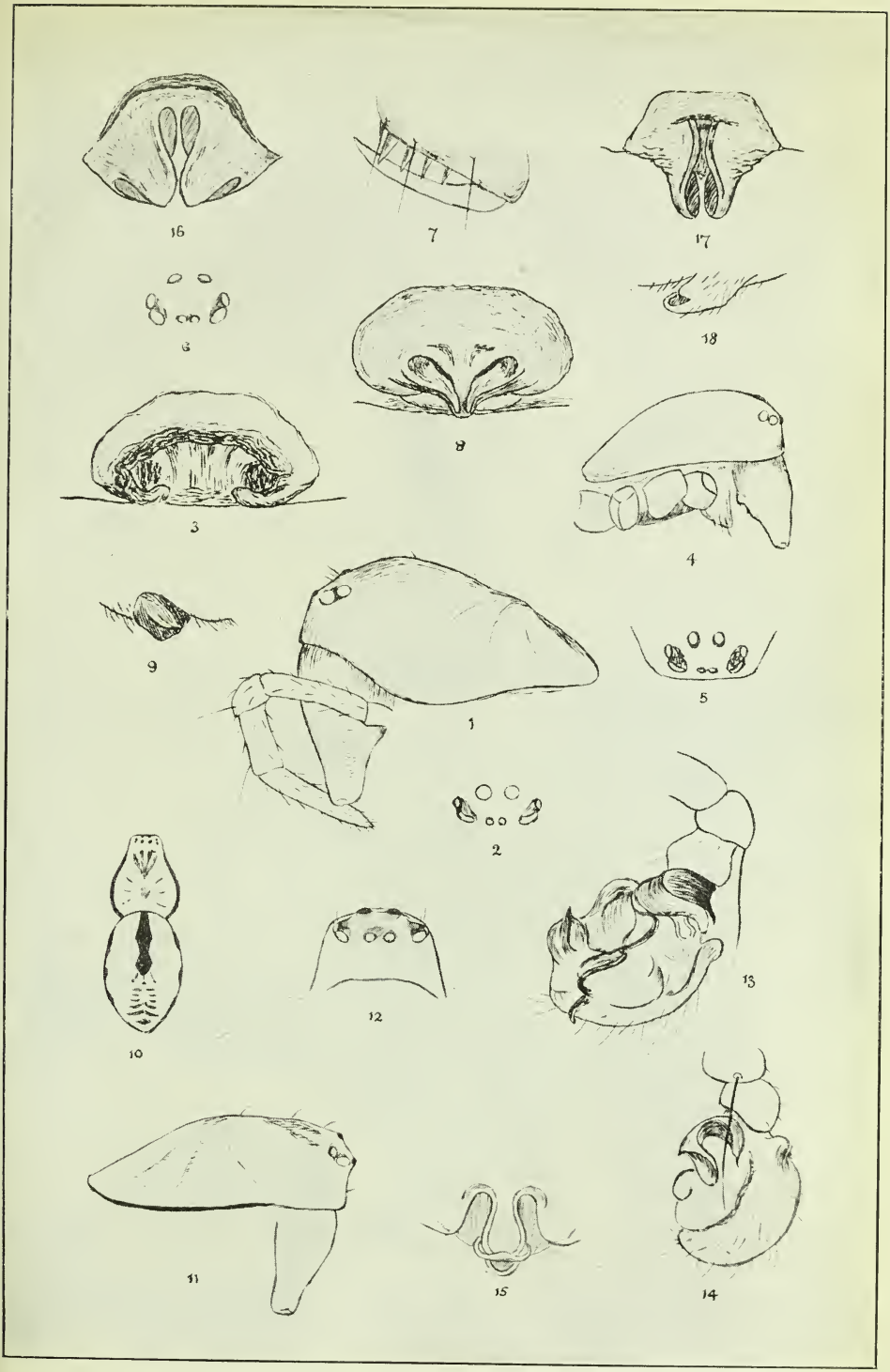
Eyes.—Laterals on strong tubercles, oblique, the anteriors largest of all; upper line slightly bowed backward, intervals nearly equal; front medians smallest of all, close together, lateral intervals equal to those of the upper line.

Legs without femoral or metatarsal spines; tibial spines slender, two on each tibia, dorsal, uniform in size and strength; tibiæ of the first pair with a lateral spine in front, very slender, within the apical half; tarsus and metatarsus of the first pair equal; tarsus of the fourth pair two-thirds the length of the metatarsus.

Abdomen longer than the cephalothorax, oblong-oval, covered with longish hairs.

Coloration.—Cephalothorax pale greenish brown with indistinct dusky rays; legs, palpi, falces, yellow tinted with brown; abdomen greenish, showing traces (in spirit) of narrow transverse bars on the upper surface behind.

Epigyne rising into a transverse ridge, the summit of which is the strongly wrinkled margin of a transverse oblong cavity



New and Rare Spiders.

occupying nearly the whole of the posterior slope. There is a wide opening in the hinder wall of this cavity, from which a band narrowed in the middle stretches across to the opposite boundary. On either side of this band the surface of the cavity is very dark brown, and the wrinkled rim is of the same colour throughout its length.

Postscript.—Types of *Hilaira pervicax* have been carefully compared with the type of *Erigone consimilis*, Cb., in the British Museum, and Mr. Pickard-Cambridge is satisfied that they are not identical. Several examples of both sexes of the spider recorded above as *Microneta cauta* having been submitted to him, he is of opinion that they are *Microneta passiva*, Cb. This is the first definite recognition of the female, and the present is the first record of the species for Northumberland.

REFERENCES TO PLATE XII.

1. *Hilaira pervicax* ♀, cephalothorax with left palp.
2. ,, ,, eyes from above.
3. ,, ,, epigyne.
4. *Gongylidiellum latebricola* ♀, cephalothorax.
5. ,, ,, eyes from above.
6. ,, ,, eyes from in front.
7. ,, ,, extremity of the left mandible.
8. ,, ,, epigyne.
9. ,, ,, same, lateral view.
10. *Bolyphantes expunctus* ♂, body without appendages.
11. ,, ,, cephalothorax.
12. ,, ,, eyes and clypeus.
13. ,, ,, right palpus, outside.
14. ,, ,, another view of the same.
15. ,, ,, ♀, epigyne.
16. *Diplocephalus picinus* ♀, epigyne.
17. *Savignia frontata* ♀, epigyne.
18. ,, ,, same, lateral view.

HISTORY OF THE BROWNEY VALLEY.

A Lecture delivered before the Natural History Society on November 9th, 1904.

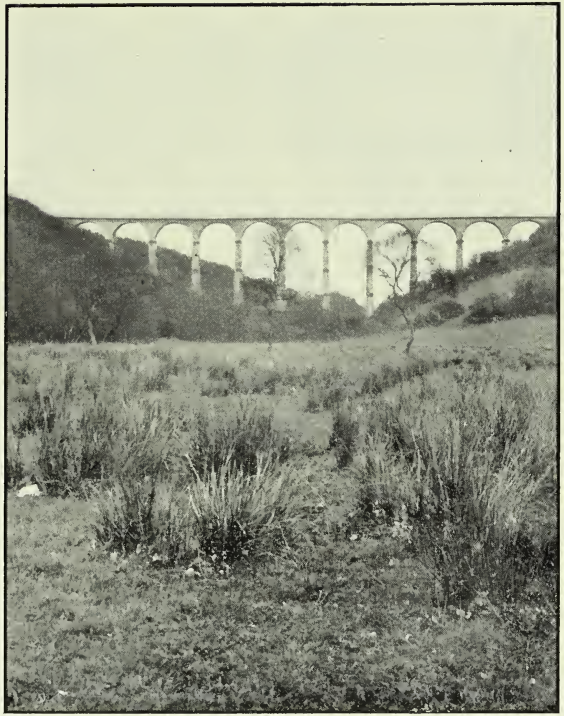
By the Rev. Arthur Watts, F.G.S.

The Browney is but a small river, some twenty miles long, yet it is an ancient river, and its vicissitudes have been great; moreover it has fallen from a high estate, having once been twice as long as it is now, and of more than twice its present volume. Pretty as its valley still is, it was once much prettier, all its features being on a larger scale, besides adding to its present attractions those of lake and waterfall.

On a far larger scale, for disregarding the lowering of our hills by the denudation of long ages, we find the Browney at one time cut its way at least 159 feet 4 inches deeper than its present bed, and that not near its mouth but near the middle of its present course, at Langley Park, by Witton Gilbert Station.

Our purpose to-night is to recall some of those vicissitudes, some of those vanished attractions; to unravel, to some extent, that ancient history, and through this one little valley to get some idea of the whole North-East of England in byegone times.

The earlier pages of its history have gone beyond recall. They date back to the Permian times when our county last began to lift its head above the waters of the deep and become dry land, whilst all England south of us was still deep sea. Indeed the south-eastern part of Durham county was under water through Triassic times; and much of our southern neighbour Yorkshire remained deep sea all through Triassic, Liassic, and Oolitic times, whilst its south-eastern portion continued so right through the Cretaceous age, only becoming dry land in quite recent times. Our county's age therefore is most venerable. It has been continuously dry land from the



Howen's Gill and Viaduct from the North.

In foreground the bed of the feeding lake at its outlet.

A Quarry in the Red Hills, Durham.

Morainic matter.

Lias through all the æons of the Oolite, Chalk, and Tertiary formations up to to-day, and all through that vast period the general contour of our county has been as it is now: its highlands have been in the west and its lowlands in the east, therefore its valleys have been approximately as now; and much of the Browney Valley is pre-glacial. Of course all the valleys have been infinitely varied as the wear and tear of these countless ages have gradually stripped off our great anticlinal of the Pennines the many thousands of feet which constitute the Triassic and Permian rocks; and then have scoured out the present valleys in the deeper and older Carboniferous rocks, of which valleys our little Browney Valley is one. The records of these ages are up above the clouds, irrecoverably lost.

Not so however with the records of later times. They are with us, and it is our aim to hunt them out and spell out the fascinating story they have to tell.

They tell us that not only is the Browney a most ancient river, infinitely older than Thames or Severn or Trent, but they tell us a considerable amount of details, at least during and since that last Glacial Age which may be said to have introduced with "Drift Man" modern times. And though this may only cover some 75,000 years, yet even that may be considered enough to justify us in describing the Browney as an ancient river, although this period is in its complete life history only as the tick of a clock in the life of a man.

It is my privilege to introduce some of these records to you and to help you to read them.

To do this effectively we propose to limit our attention to one group of records, those afforded by morainic matter.

The deltaic remains at the mouth of the Derwent by Blaydon; the picturesque cliffs and deserted watercourse of Howen's Gill by Consett; the ancient river bed of the Browney revealed in the Langley Park and Bearpark pits below the Busty coal-seam, might with equal propriety and interest have been chosen, for they all combine to tell the same story; but to-night our choice falls on that great deposit of morainic

matter which begins by Neville's Cross, follows the line of the Red Hills, and skirting the western side of the Wear Valley passes by Aykleyheads and Kimblesworth to Plawsworth, and can be traced through its successors on by Chester-le-Street and Ravensworth to Marley Hill, where, so far as I know, their existence ends. With these successors we have little further concern to-night, though they have exercised a profound influence over the later history of the Wear.

The Red Hills moraine, as for convenience we may call it, the first of the series, claims now our exclusive attention. The Browney tells us the story of its birth, and in the doing of it carries us back to the last Ice Age, commonly known as the Glacial Age, an age so recently departed that its foot-prints are clearly discernible by the seeing eye, everywhere up Browney Valley.

Let me briefly summarize the doings of the ice in our County of Durham in this Glacial Age. It had three periods, one of advancing glaciers, a maximum period with ice-sheet, and a last, of retreating glaciers. Neither the advancing nor the retreating were probably unbroken; the latter certainly was not, as the Derwenthaugh evidence proves.

Now the fossils of the preceding geological formations, the Cretaceous and Tertiary, show that this land enjoyed a genial clime, which gradually departed, leaving first our hills and mountains covered with snow and ice, and later our valleys too, until even the North Sea was invaded, our whole county wearing an ice mantle. This was first purely a home product, and being on a slope, was ever on the move in the direction of the slope, namely from west to east; hence our whole county is strewn with local travelled stones whose home is always found westwards. Remember that from the beginning of the Glacial Age Durham had its own glacier, and though afterwards dwarfed by greater ice-streams, it continued to have its little say till the whole ice story was told.

This Durham glacier with its névé occupied Upper Teesdale, the whole of Weardale, and South Tynedale, its head being in the Cross Fell range.

Round this head swept two other ice streams from the north-west, clearly defining the southern and northern limits of this Durham glacier, the southern occupying most of Teesdale, and the northern Tynedale. Thus the enclosed fan-like area was wholly covered by local ice. All three streams moved at first from west to east, from the range of the Pennines to the North Sea. This Durham glacier has left us an important deposit in the moraine of Hawthorn Dene; a travelled stone belonging to which I described at a Tyneside Naturalists' Field Club meeting at Ravensworth Castle in May, 1879, and an account of which appeared in the Transactions of that year. The mouth of the Dene is even yet choked by materials brought from the west of our county, just as the morainic and other deposits of the two bounding glaciers are equally distinguished by the Shap granites in the one case and by the Criffell granites in the other, mingled of course in both cases with materials from our own western uplands.

The ice that invaded Durham county from outside came from three distinct quarters, and at three distinct times, dependent perhaps upon distance. In any case the nearest came first, namely, that from the mountainous north-west, by the valley of the Eden over Stainmoor and down into Teesdale; whilst another branch from South-West Scotland came simultaneously, as the Solway stream of ice, over the track of the present Carlisle and Newcastle railway, roughly in the line of the great Roman Wall, till joining the glacier of the South Tyne it swept down lower Tynedale towards the sea.

Had this been the only invasion the glaciation would have been on the general plane of our county, from west to east; but there were two other invasions which exercised a considerably modifying influence by directing their lower courses southwards, as both came from the north.

The nearer of these came from the Cheviots and South-East Scotland, reaching our neighbourhood by the valley of the North Tyne. The thrust of this ice-stream drove the western

ice towards the south, and when joined a little later by the Scotch ice that had outflanked the Cheviots and traversed Northumberland, did so more effectually.

An early result was the formation of a line of glacial lakes along the edge from Blanchland to Castleside and the upper Browney. Later still, when the Scandinavian ice had actually arrived off our coast, it completely dammed the Upper Derwent, and in the far off days of its retreat northwards led to the formation of Consett lake, diverting the stream of the Upper Derwent down the valley of the Browney into the Wear at Durham City, to which fact we owe the Red Hills moraine, or at least its magnitude. This glacier from the North Tyne reached its maximum later than the western ice-flow; when crossing the watershed between Derwent and Browney it scattered its boulders on the northern side of that valley at Iveston, Lanchester, and Witton Gilbert.

The thrust of the great Scandinavian ice-stream was thus powerfully felt, first indirectly and later directly, though the ice itself does not appear to have touched any part of our coast: though it did that of our neighbour Yorkshire, which it freely invaded, driving the Durham and western ice southwards through the heart of Yorkshire, so that when the Glacial age was at its best, Durham and western ice travelled beyond the city of York, and probably reached the sea at the Wash by an ancient mouth of the Trent. How long it continued to do so we know not, but the remains and its work show it was a long time.

Ultimately amelioration came and the ice began to retreat; and in the same order too, for the effects of the milder climate would be first felt at home, then in Cumberland and Galloway, next in Cheviot and South-East Scotland, and last in Norway. It is important to remember this, or the lakes and moraines which marked the line of retreat, and whose work is yet with us, will not be properly understood nor duly appreciated. Three of these lakes and two moraines play an important part in the history of the Browney Valley, to which we now definitely return.

Deserted Watercourse of Knitsley Gill.

Looking towards Howen's Gill.

When the northern ice-stream crept up the Pont, over the ridge by Leadgate, and swept down the Browney Valley by Smallhope Burn in its greatest strength, it pushed its way across Durham city, and on by Shincliffe, till becoming merged in the greater Wear ice, it travelled I know not how far south, a friend tells me as far as Cannock Chase, nearly in the middle of England.

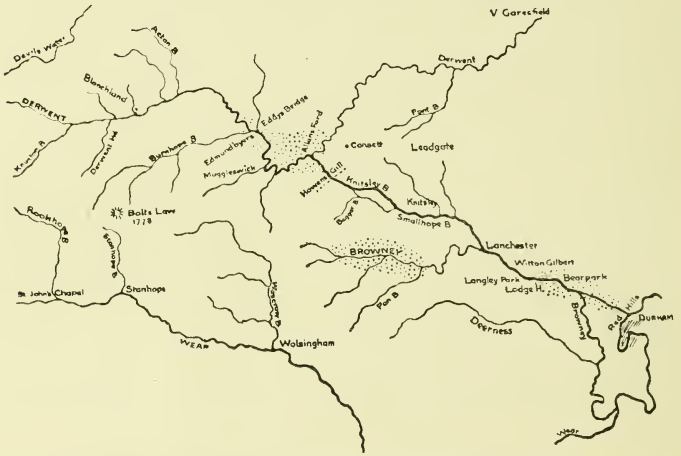
When, however, this northern ice-stream began to retreat, and the thrust westwards grew feebler and feebler, it slowly retired till it occupied only its own valley. In this state of things the lesser Browney ice, coming at Durham into contact with the greater Wear ice from Stanhope and Auckland, naturally had to bend in the direction in which the greater was moving, viz., towards Chester-le-Street, and this condition of things lasted till both ice-streams were ultimately replaced by rivers, as now. Whatever debris therefore came down Browney Valley would be deposited near the nose of the glacier, or be swept onwards in the direction of the Wear movement. So we can understand why our Red Hills moraine extends by Neville's Cross, Aykleyheads, and Kimblesworth to Southill and Plawsworth, and also how it is that a line of hills three or four miles long should be entirely composed of sand and gravel, with here and there clay patches and isolated boulders. Here is one of the finest morainic deposits in the county, and yet from so small a stream as the Browney. Why?

Because the Browney was not then the small stream that we know by that name, for it then found its source in Derwent Head and Bolt's Law, and discharged the waters of the Derwent as well as its own, and therefore was comparable with the Wear itself above Durham.

This lasted as long as the ice-dam near Burnopfield and Lintz Ford held up Derwent waters, and formed the glacial lake of Consett. The chief or only overflow from this lake was by Howen's Gill into the valley of the Browney by Smallhope Burn.

When the dam gave way, and the ice retreated by Garesfield and Greenside,* Consett lake was drained, the Derwent resumed its old course, and the water supply by Howen's Gill and Knitsley Gill dwindled into its present insignificance. But the depth of Howen's Gill at the Viaduct, considerably over 200 feet (156 + x alluvium), shows that it so flowed for a very long time.†

Meanwhile similar glacial lakes were being drained elsewhere, and one such by what is now the main stream of the Browney, fed from a gut by the farm known as Lindisfarn. This stream, rising by Tow Law, flows by Satley, and joins the other source by the Roman camp at Lanchester.



Sketch-map of the Derwent-Browney at the time when Howen's Gill was in operation.

The dotted areas mark the sites of glacial lakes.

Still another lake demands attention, and one of a somewhat different character. Our Red Hills moraine, at first helped by Wear ice, dammed up the Browney, and a lake was formed around Lodge Hill between Witton Gilbert and Bearpark, so that Witton Gilbert Church stands on what was once a promontory jutting out into a lake. This lake probably

* See Appendix I.

† See Appendix II.

had two overflows, one that was constantly being impeded, and the other constantly being improved. The one was by the river's old course through the moraine along the "Still," and by Flass bog to Milburngate into the Wear. The other, skirting the moraine westwards, found vent, as the dammed waters rose, close by Bearpark ruins. The lake stood long enough for this latter overflow to cut its bed deeper down than the old obstructed course, so that when Lodge Hill lake was eventually drained, the Browney stream took the new course entirely, and flowing westwards of the moraine soon picked up the Dearness and converted it into a tributary of the Browney instead of as heretofore of the Wear.

Finally the obstructed course became a brooklet, whose upper course began to flow the reverse way, namely westwards as it does to-day, and whose lower portion, dwindling into the Flass Burn, feebly strove to preserve the old track; but unsuccessfully, as we men of Durham wanted what is to-day known as the North Road. The youngest portion therefore of the Browney Valley is that from Bearpark to the Wear, or strictly, to the junction of the Dearness.

From a similar cause the youngest portion of the Wear is that from Chester-le-Street to Sunderland; and the successors of our Red Hills moraine are responsible for that, as also for the great deposit of clay at Birtley, and so for the conversion of the Wear from a tributary of the Tyne to an independent river.

The valley of the Browney in its prime clearly consisted of five distinct parts: first, the Upper Derwent down to Benfieldside; second, Howen's Gill, Knitsley Gill, and Smallhope Burn down to Lanchester, once important, now insignificant; third, from the present source above Satley also down to Lanchester; fourth, the middle and most persistent area, from Roman Camp to Bearpark ruins; and fifth, the newest part from Aldwin Grange to Butterby. The Red Hills moraine came into being when the Browney river was at its prime, and is the child of the Browney.

Is it not a wonderful record and deeply interesting? And perhaps the greatest wonder is that a few stones with much sand and dirt can be the relators of such a story. The boulders and travelled stones are the chief narrators of these interesting changes. Many of them we can locate with absolute certainty; and perhaps in time we may trace most of them home, and so extract from them the full story of their travels and adventures, making the history of our Browney Valley complete.

Precisely the same kinds of stones have been found by me in the Red Hills, at Kimblesworth, Witton Gilbert, Lanchester, Iveston, Burnopfield, Garesfield, and Marley Hill; and it is chiefly from those in the upper strata of the deposits, namely those that were the products of the retreating stage of the Ice-age, that our story is woven.

Appendix I.

At a meeting of the Durham Naturalists' Union, 1st July, 1905, I drew attention to the following facts, and drew deductions therefrom :—

Morainic deposits cover the district from the sliding braes between Lintzford Station and Paper Mill to Greenside. They form seven successive parallel lines of hills along an axis running N.N.W., and showing the line of retreat of the ice, which crosses the Tyne by Eltringham.

The parallel lines are :—

1st. The Strother hills, about 300-ft. high.
2nd. Beda hills and on to Chopwell, about 400-ft.
3rd. A line by St. Patrick's Church, 479-ft.
4th. A line by Hooker Gate, about 500-ft.
5th. From Comb Wood to High Spen, 516-ft.
6th. A line from Rickless to nigh Stella Hall and Park, in part known as Bewes Hills.
7th. Sand deposits at Gray's Well, Greenside.
8th. At Eltringham-on-Tyne a cannel coal similar to that found so freely in these parallel deposits is yet worked. This colliery is in the line of retreat of the ice dam.

Appendix II.

19th May, 1905, a bore-hole was sunk behind Todd Hill farm, immediately facing the outlet by Howen's Gill from Derwent Valley to Browney Valley, to a depth of 140 feet, and the strata passed through were :—

	ft.	ins.
Soil	1	0
Boulder clay	25	0
Shale, seggar, ganister, sandstone, &c.... ...	42	9
Shale and coal	7	0
Seggar	29	6
Coal	0	6
Into white "Post"	34	3
	140	0

Notes on some Pauropoda from the Counties of Northumberland and Durham

By Richard S. Bagnall, F.E.S.

The order Pauropoda is composed of numerous minute animals belonging to three families, the *Pauropodidæ*, *Brachypauropodidæ* and *Eurypauropodidæ*; and though, as yet, species belonging to the *Pauropodidæ* alone are known as British, representatives of the other two families will probably be found in our Islands.

The order possesses particular interest to us inasmuch as the type species of the order (*Pauropus Huxleyi* Lubbock, and *Stylopauropus (Pauropus) pedunculatus* Lubbock) were first discovered by an eminent British naturalist, Lord Avebury, in the neighbourhood of London in 1866, and described in his classical memoir "On Pauropus, a new type of Centipede."

Since then several authors have devoted some attention to the members of this difficult order, chiefly Latzel in his renowned work "Die Myriopoden der Oesterreich-Ungarischen Monarchie" in 1880–84, and more recently Hansen who, in 1902, monographed the order in his usual most comprehensive and masterly manner.* This latter work is beautifully illustrated and invaluable to anyone studying the Pauropoda, but is unfortunately rare and difficult to obtain. It would seem that the order Pauropoda is in reality comparatively rich in species, and that the members are most probably of almost world-wide distribution, Dr. Hansen considering that they will be found in all countries excepting only in the Arctic and sub-Arctic regions.

So far as I can gather, no species have been recorded from Great Britain since the publication of Lord Avebury's memoir, nor have further British records of his species been made,

* On the Genera and Species of the Order Pauropoda (Videnskr. Medd. fra den naturh. Foren. i Kjöbenhavn, 1901, pp. 323-424, pls. i.–vi., Copenhagen).

though they have been recognized in several European countries. This is probably on account of the minute size of the animals, and also because they belong to, or are nearly allied to a class which has received but comparatively scanty attention from most British naturalists.

In May of this year I found several species of Pauropoda, including four that I am able to identify with tolerable certainty; and as during that month I found Pauropoda wherever I searched for them, I feel convinced that this group is comparatively richly represented in our fauna.

I at first thought of withholding these records until I had amassed more material; but as I see very little opportunity of making a special study of the group for some years at least, it would seem advisable to publish these notes. *Pauropus vulgaris* Hansen, and *P. gracilis* Hansen, are for the first time recorded as British, and it is worth noting that all the known British forms have occurred in our counties.

I should mention that I have only had the opportunity of consulting Lord Avebury's memoir and Hansen's paper. Dr. Hansen, whom I had the pleasure of recently meeting in Copenhagen, told me, however, that since he published his monograph Silvestri had written on the Italian species, whilst in a recent edition of "Acari, Myriop. et Scorp. huc. in Italia rep.," Berlese had dealt more fully with the Pauropoda.

PAUROPODIDÆ

Genus STYLOPAUROPUS (Cook) Hansen

Stylopauropus pedunculatus (Lubbock).

Pauropus pedunculatus Lubbock, Trans. Linn. Society, xxvi., p. 185, pl. x., fig. 20, 1867; Latzel, Myriop. d. Osterr.-Ung. Monarchie, II., p. 27, 1884; Berlese, Acari, Myriop. et. Scorp. huc. in Italia rep., fasc. xxiii., no. 1 (1887).

Stylopauropus pedunculatus Hansen, Vidensk. Medd. fra den naturh. Foren., 1901, pp. 342–6, pl. i., figs. 1a–1i., 1902.

This is the largest known species of the order, measuring from 1·5 to 1·7 mm. One evening early in May, 1909, I found several examples under the loose bark of an old and fallen willow lying in a damp spot in a dene between Washington and Hylton, Co. Durham.

A second species, *Stylopauropus pubescens* Hansen, is described from Marburg, Hesse (Germany). It is a small animal, and the characters given by Hansen in his conspectus of the species are particularly valuable and good ones.

British Distribution.—Near London (Lubbock); and in a dene on the Wear between Washington and Hylton, Co. Durham, May, 1909.

Distribution.—Evidently widely distributed in Central and Southern Europe.

Genus PAUROPUS Lubbock

Pauropus Huxleyi Lubbock.

Pauropus Huxleyi Lubbock, Trans. Linn. Society, xxvi., p. 182, pl. x., figs. 1–19, 1867; Latzel, Myriop. d. Osterr.-Ung. Monarchie, II., p. 23, pl. xi., figs. 10–12, 1884; Berlese, Acari, Myriop. et. Scorp. huc. in Italia rep., fasc. xxi., no. 1 (1887?); Hansen, Vidensk. Medd. fra den naturh. Foren., 1901, pp. 355–360, pl. i., figs. 3a–3f, and pl. ii., fig. 1a, 1903.

A single example from under the damp bark of an old fir stump in a wood near Winlaton Mill, June, 1909. Professor Hansen points out that all the immediate allies of *P. Huxleyi* are American forms.

British Distribution.—Near London (Lubbock); Derwent Valley, near Winlaton Mill, Co. Durham.

Distribution.—Of wide European distribution.

Pauropus vulgaris Hansen.

Pauropus vulgaris Hansen, Vidensk. Medd. fra den naturh. Foren., 1901, pp. 392–5, pl. v., figs. 2a–2g, 1902.

This minute and slender species is apparently not uncommon in the counties of Northumberland and Durham.

The form of the anal plate readily distinguishes it from all other species, whilst the shape of the third pair of tactile setæ, each of which has the distal third more slender than the preceding part and sparingly furnished with rather long erect pubescence, is another good character.

British Distribution.—Under logs lying by the roadside, and under the bark of standing tree stumps in a wood on the banks of the Wansbeck near Mitford, Northumberland; and under stones and logs in woods and fields, Brockwell, Axwell Park, Winlaton, and Winlaton Mill, in the Derwent Valley, County Durham, May, 1909.

Distribution.—Denmark (Hansen); England.

Pauropus gracilis Hansen.

Pauropus gracilis Hansen, Vidensk. Medd. fra den naturh. Foren., 1901, pp. 395-7, pl. v., figs. 3a–3f, 1902.

On the occasion of the meeting of the British Mycological Society held in Gibside on October 4th, 1907, I found a very minute species of Pauropus living in numbers beneath the bark of a fallen tree lying in a damp situation, and also amongst dead leaves near by; in July, 1908, the species was again seen, whilst in May of this year I gathered numerous specimens, all of which are referable to *P. gracilis* Hansen. I have also specimens from Mitford.

Though closely allied to *P. vulgaris* Hansen, the species is, I think, abundantly distinct, and may at once be separated by the form of the third pair of tactile setæ, and by the anal plate, which differs very considerably from that in *P. vulgaris*. It is also a smaller animal (about 0·6 mm.), and even more slender than *P. vulgaris*.

British Distribution.—Under bark of fallen trees and amongst dead leaves, Gibside, County Durham, May, July, October; and under bark of a fallen fir branch and of standing tree stumps, Mitford, Northumberland, May, 1909.

Distribution.—Denmark (Hansen and Mortensen), Italy (Hansen), and Germany (Börner); England.

Many of the examples taken at Mitford, where they occurred in large numbers and gregariously, are referable to a fifth and apparently undescribed species. Probably later I shall find the opportunity of writing in detail of the British species of Pauropoda. These minute creatures should be searched for in damp situations, under bark of stumps and logs, under stones and amongst leaves. They look not unlike small white springtails, but differ altogether in their sharp bustling movements, and in such manner may at once be recognized.

REPORT ON THE FIELD MEETINGS OF THE NATURAL HISTORY SOCIETY FOR 1907

Read March 19th, 1908, by Mr. J. Alaric Richardson, Chairman of the Field Meetings Committee for 1907.

Ladies and Gentlemen,—In presenting my report on our Field Meetings during the summer of 1907 I am glad to be able to say that this branch of the Society's work still flourishes. The meetings have been fairly well attended, and some of our members have done much good work.

As regards weather, the general impression left by the summer of 1907 is one of disappointment. June, July, and August seemed to be continuously wet, with but little sunshine; September did something to retrieve the year's reputation, but October was a depressing month of cold and wet, and the harvest generally very late. Fortunately our Field Meetings fell for the most part on the finer days, though the expectation of bad weather may have prevented some from joining us. Those who did brave the elements were for the most part rewarded with beautiful days.

The First Field Meeting was held on May 11th. It was a half day's excursion to Gibside, and was well attended, more than forty members and their friends gathering at Swalwell station. Here we were taken in charge by our last president, Mr. Richard Adamson. The day was brilliantly fine, and beautiful views were obtained. Vegetation was well advanced, and most of the smaller migratory birds were to be seen and heard. The route followed led us first to Hollinside farm and the ruins of Hollinside Castle, and after these had been inspected, a short walk brought us into Gibside Park. Once within its splendid woods it was difficult to imagine that one was within a short walk of a large manufacturing town.

Here the party split up into groups, each following their own favourite course of study. Birds, among which the

Willow Wren, Wood Wren, and Tree Pipit were prominent, were numerous, and the botanists also found much to interest.

The monument was visited, and as the afternoon wore on the party gradually made their way to Gibside Hall, where all assembled and were most hospitably entertained by Mr. and Mrs. Grunhut. An account of the hall and its builders given afterwards by Mr. Grunhut was much appreciated.

After tea the old fish-ponds, chapel, and mausoleum were visited, and one of our members, an enthusiastic botanist, gave to a small number an account and explanation of that truly parasitic plant the Toothwort, which added much to the interest of the occasion, and is a practice which I venture to think might with advantage be more frequently followed.

After this time did not permit us to do more than to make for Rowland's Gill station, whence we took train for Newcastle.

Among the flowers observed in bloom were :—

Wood Anemone	Golden Saxifrage
Lady's Smock	Woodruff
Bird Cherry	Whortleberry
Lady's Mantle	Toothwort
Moschatel	Wild Hyacinth
Wood Sorrel	Great Woodrush
Bitter Vetch	Field Woodrush

Of the birds seen the following list was kindly given me by one of our members, a resident in the district and an ardent ornithologist, all the birds mentioned having been seen by him in the immediate neighbourhood, and during the time occupied by the excursion.

Fieldfare (11 birds together)	Dipper (nest)
Wheatear	Long-tailed Tit
Whinchat	Marsh Tit (nest and 7 eggs)
Redstart	Cole, Blue, and Great Tits
Blackcap Warbler	Grey Wagtail
Willow Wren (very numerous)	Swallow
Wood Wren (not so common as in former years)	Sand Martin
	House Martin
Sedge Warbler	Hawfinch

Tree Sparrow
Redpoll (numerous)
Bullfinch (a pair; not seen a pair at this time for 5 years)
Common Bunting
Reed Bunting
Jay and nest
Magpie and nest
Jackdaw
Swift
Great Spotted Woodpecker and nest
Tawny Owl
Kestrel
Mallard
Ring Dove
Stock Dove (nest and 2 eggs)
Water Hen
Coot

A notable list to be seen so near the town and in a thickly populated district, and which shows how well this spot is adapted to the habits of our smaller birds.

The Second Field Meeting was held on the week-end June 8th to 11th, in Upper Teesdale. Although the weather during the last few days had been the reverse of encouraging, seven members met on Saturday morning at the Central Station and took train for Middleton-in-Teesdale. On arriving there we found conveyances to meet us, and immediately set off to High Force, where a halt was made. It had previously been decided to make Langdon Beck Hotel the headquarters, as it is nearer the places which we most wished to visit; but as the accommodation there proved limited, it was found necessary to divide the party, some staying at High Force and others at Langdon Beck. These arrangements being made, we walked down to have a look at the famous Force, which was in fine ply, as the river was full from the recent rain. In the beautiful woods here several interesting plants were seen, and at the Force a pair of Pied Wagtails noticed busily engaged in feeding their brood in a nest on the central portion of a rock.

Leaving a part of our forces here, we continued our drive to Langdon Beck, where we found excellent quarters. After tea we walked back towards High Force and met our friends, and made plans for the morrow.

It was decided to explore Cronkley Fell, a high plateau lying on the south bank of the Tees, and well known to botanists as the home of many rare plants.

The next morning broke fine and clear, and we made an early start. We crossed the stream by the bridge, and followed through the meadows, here thickly strewn with the Mountain Pansy in its beautiful and endless variety of colour; while overhead a Snipe drummed, and Redshanks and Peewits called. Arrived at the hillside a slow ascent was made, with many a pause to take breath and enjoy the views opening out to the northward.

Once at the summit our course lay westward, in search of the patch of silver sand where our botanists were in hopes of finding some of the special rarities for which the Fell is known. The Fell proved to be broken peat ground. Golden Plover and occasional Grouse were seen, but though the former showed great anxiety, careful search failed to find either eggs or young. Some large moths were seen, probably the Oak Egger, but proved too strong on the wing to be captured and identified.

After some search the silver patch was found, and here we were pleased to find the Shrubby Cinquefoil and the Mountain Avens; though it is much to be feared that the depredations of greedy botanists and collectors will soon cause these interesting plants to be no more than a memory. Then we took our lunch, and after a rest followed the spur of the hill down into the valley of the Tees, reaching it not far below the junction of the Maize Beck. Turning towards our lodgings, we followed the course of the stream along the base of Cronkley Scarrs. There we were glad to see the Ring Ousel fairly numerous, but looked in vain for the Raven or Peregrine Falcon, both of which fine birds, once well established here, have now been banished by the gamekeeper and collector; though even now in the early spring one or two are frequently to be seen. Continuing past the old slate pencil quarry, we reached the bridge we had crossed in the morning. Here we separated for our respective lodgings; but those who went towards Langdon Beck were caught in a heavy thunderstorm which had been brewing for some time, and got a thorough wetting, which those going to High Force escaped. This storm

seemed to have been pretty prevalent over the northern counties, as Newcastle was visited at about the same time; and further north, at Otterburn on the Reedwater, the rain was so violent as to cause a sudden flood, the river overflowing its banks, flooding the village, carrying away the bridge, and causing much damage.

The next morning broke with a threatening aspect. The party met at Langdon Beck, and immediately set off for Cauldron Snout. Crossing the Harwood Beck we entered the Widdybank Fell, where Snipe, Redshanks, and Peewits in a great state of alarm showed that we were in the neighbourhood of their eggs or young; but beyond a few Peewits' and one Grouse nest none were found, nor did time permit of a very lengthy search. Here the Bird's-eye Primrose was found in great profusion; and as we got rather further on the beautiful Spring Gentian also.

Then after taking shelter behind some rocks against a heavy driving shower, we descended the hill to the Tees valley, proceeding up the stream below the lofty cliffs known as the Clints, where a Kestrel and several Ring Ousels were seen, and Sandpipers common by the water side. There on the cliff sides and among the broken rocks at its base the botanists found much to arrest their attention, and several rare ferns and the Mossy Saxifrage were found among other interesting plants. About here we halted for lunch, and then continued up the valley to the Cauldron Snout, where the stream coming over in full flood made a splendid spectacle.

Then we mounted the bank, and were overtaken by a heavy shower, against which we took such shelter as could be found among the rocks. Then we took the path across the moor, from where we could see the long pool of still water known as the Wheel, and note the course of the valley far up into the hills on the borders of Westmoreland.

Reaching the main road, we made some examination of the lead mines, here being worked with energy; and from thence following the main road arrived at Langdon Beck.

Tuesday morning was fine, but a high wind led us to seek the lower and more sheltered part of the valley. Accordingly we set off for High Force, which now, with the Tees in full flood, presented a fine sight. The river was crossed a short way below the Force at Holwick Head Bridge, and a delightful walk enjoyed along the banks as far down as Wynch Bridge, where the river was re-crossed and a return made to High Force. Then lunch was taken, after which we drove back to Middleton-in-Teesdale station, bringing a most enjoyable excursion to a close.

Among the birds noticed were :—

Kestrel
Lapwing (nest of eggs and nearly full fledged young)
Golden Plover
Curlew
Redshank
Snipe
Common Sandpiper
Cuckoo
Wheatear
Ring Ousel
Water Ousel
Swift
House Martin
Common Bunting
Wood Wren
Willow Wren (nest and eggs)
Grey, Pied, and Yellow Wagtails
Spotted Flycatcher
Lesser Whitethroat
Redstart (nest and young)
Meadow Pipit
Lark, etc.

Among the flowering plants, ferns, and mosses were :—

First Day.—Cronkley Fell.

Starry Saxifrage, *Saxifraga stellaris.*
Mossy Saxifrage, *Saxifraga hypnoides.*
Vernal Sandwort, *Arenaria verna.*
Viviparous Bistort, *Polygonum viviparum.*
Globe Flower, *Trollius europæus.*
Small Marsh Valerian, *Valeriana dioica.*
Milkwort, *Polygala vulgaris.*
Scurvy Grass, *Cochlearia officinalis.*
Dog Violet, *Viola arenaria.*
Mountain Pansy, *Viola tricolor.*
Dwarf Lousewort, *Pedicularis sylvatica.*
Mountain Scottish Asphodel, *Tofieldia palustris.*
Parsley Piert, *Alchemilla arvensis.*

Also found, but not in bloom :—

Round-leafed Sundew, *Drosera rotundifolia.*
Shrubby Cinquefoil, *Potentilla fructuosa.*
Mountain Avens, *Dryas octopetala.*

SECOND DAY.—WIDDYBANK AND CAULDRON SNOUT.

Marsh Marigold, *Caltha palustris.*
Mossy Saxifrage, *Saxifraga hypnoides.*
Butterwort, *Pinguicula vulgaris.*
Spring Gentian, *Gentiana verna.*
Bird's-eye Primrose, *Primula farinosa.*
Cloudberry, *Rubus Chamæmorus.*
Mountain Cudweed, *Antennaria dioca.*
Masterwort, *Peucedanum ostruthium.*
Twisted Podded Whitlowgrass, *Draba incana*

Found, but not in bloom :—

Yellow Mountain Saxifrage, *Saxifraga aizoides.*
Melancholy Thistle, *Carduus heterophyllus.*
Red Bearberry, *Arctostaphylos Uva-ursi.*
Sweet Cicely, *Myrrhis odorata.*

THIRD DAY.—BELOW HIGH FORCE.

Spotted Orchis, *Orchis maculata.*
Butterfly Orchis, *Habenaria bifolia.*
Twayblade, *Listera ovata.*
Wild Hyacinth, *Agraphis nutans.*
White Meadow Saxifrage, *Saxifraga granulata.*
Toothwort, *Lastræa squamaria.*
Good King Henry, *Chenopodium Bonus-Henricus.*
Wood Geranium, *Geranium sylvaticum.*
Shining Cranesbill, *Geranium lucidum.*
Herb Robert, *Geranium Robertianum.*
Whitlow Grass, *Draba verna.*
Hairy Rockcress, *Arabis hirsuta.*

CLUB MOSSES.

Alpine Clubmoss, *Lycopodium alpinum.*
Fir Clubmoss, *Lycopodium Selago.*
Fir Clubmoss, *Selaginella selaginoides.*

FERNS.

Adder's-tongue, *Ophioglossum vulgatum.*
Common Polypody, *Polypodium vulgare.*
Beech Fern, *Polypodium Phegopteris.*
Oak Fern, *Polypodium Dryopteris.*
Parsley Fern, *Allosorus crispus.*
Shield Fern, *Aspidium aculeatum.*
Male Fern, *Aspidium Filix-mas.*
Common Spleenwort, *Asplenium trichomanes*
Green Spleenwort, *Asplenium viride.*
Wall Rue, *Asplenium Ruta-muraria.*
Female Fern, *Asplenium Filix-fœmina.*
Hard Fern, *Blechnum Spicant.*
Common Brake, *Pteris aquilina.*
Brittle Bladder Fern, *Cystopteris fragilis.*

The THIRD FIELD MEETING was held on June 26th at Bellingham. About twelve members took train from Newcastle, and were joined on the way by a few more. The day was fine, though somewhat threatening. Arrived at Bellingham we proceeded through the remains of the Bellingham Iron-works to Hareshaw Linn, following the course of the stream through the beautifully wooded valley. Three broken bridges and banks testified to the violence of the floods which had lately taken place, and the felling of a tree to replace the bridge at the well known resort just below the Linn made an interesting sight for town dwellers. The falls were visited, and the strong colony of Jackdaws on the cliffs on the north side of the stream noted; but with the exception of the commonest species other birds seemed by no means numerous, as at this time of year they are almost silent, and the thick foliage conceals them.

Tea was taken at the Railway Hotel, after which, at the kind invitation of Mr. Graham, we visited the Riding, a short distance up the valley. There we were shown the garden and some young Long-eared Owls, by which time it was necessary to return to the station; on the way there falling in with two of our members who had come across the moors

intent on entomology, and reported a most successful day. They have kindly furnished me with a list of their chief captures as follows :—

Moths : Common Heath, Small Argent and Sable, Garden Carpet, Red Twin-spot Carpet, Narrow-winged Pug, Chinese Character, Beautiful Yellow Underwing. They also secured about twenty species of lepidopterous larvæ as follows :— Muslin (common, feeding on lichin on stone walls), Pale Oak Egger (only 4 obtained, feeding on heather), Oak Egger (on heather), December Moth (3 larvæ on hawthorn), Scalloped Oak, Pale Brindled Beauty (common), Early Moth (common), Dotted Border (common), Mottled Umber, Winter Moth (common), Northern Winter Moth (common on birch), Autumnal Moth, Figure of Eight Moth, Yellow Horned Moth (common on birch), Satellite, Minor Shoulder Knot, Green Brindled Crescent (common), Marvel du Jour, Grey Chi, Common Quaker, and Two-spot Carpet.

The majority of the above were obtained by beating bushes above a tray.

The principal flowering plants were as follows :—

Marsh Marigold
Hairy Bittercress
Milkwort
Red Campion
Wood Stitchwort
Broom
Wood Bitter Vetch
Common Vetch
Tufted Vetch
Water Avens
Tormentil
Stone Bramble
Wood Sanicle
Succory-leafed Hawksbeard
Melancholy Thistle
Goldilocks
Ox-eye Daisy
Brooklime
Cow Wheat
Wood Forget-me-not
Early Purple Orchis

FERNS.

Male Fern
Female Fern
Spinulose Buckler
Black Spleenwort
Prickly Shield
Hard Fern
Mountain Buckler
Oak Fern

The Fourth Field Meeting was held on August 23rd at Howens Gill in County Durham, and was attended by a fair number of members. Very much to my regret I was unable to be present, but owing to the kindness of our secretary and some other members I am able to give some account of the day's proceedings.

Having arrived at Blackhill station, the party were met by the Rev. Arthur Watts, F.G.S., Rector of Witton Gilbert, who proved a most excellent guide, being an able geologist thoroughly acquainted with the features of the surrounding country.

The day was fine, but the attendance of members small, only seven setting off. Once clear of the railway and Consett works, a beautiful view was opened out, the formation of the land showing how, in former days, the course of the Derwent was blocked by a glacier lower down, and dammed back into a lake whose waters found their way through the now dry Howens Gill, and joined the Wear probably near the Red Hills near Durham. Borings recently made bear out this theory. Here the bottom of the valley was found to be marly clay, and the swampy soil proved to be a favoured spot for many of the rarer plants dear to botanists.

The course of Howens Gill was followed downwards, and a point rather below the viaduct, where cliffs rise on one side, is of interest to geologists, as showing with what force the water must have flowed to cut itself so deep a bed—probably some 270 feet or so below the surface of the surrounding country.

Soon the first feeder on the right bank, the Middlehead burn, was reached. On its swampy banks the Spotted Orchis, Large Red Rattle, and the rarer Marsh Cinquefoil were growing in abundance. At the Knitsley burn, the path through the Beggar Bank Wood was followed. Here there is some evidence to be seen of the former existence of another lake. The only butterfly of the day—a tortoiseshell—was seen here; owing to the thickness of the leaf and the late season of

the year, but few small birds were noticed, only the note of the Willow Wren and Yellow Hammer being occasionally heard.

The end of the Gill was now almost reached; and at a spot somewhat above Knitsley Mill the configuration of the land suggests a third lake bed.

Time now prevented further exploration, so the station was made for and train taken to Lanchester, where tea was much enjoyed, and a hearty vote of thanks given to the Rev. Arthur Watts for his able leading. Then, after a visit to the church, train was taken for Newcastle.

The following flowers were seen in bloom :—

Watercress	Sow Thistle
Ragged Robin	Mouse-eared Hawksbeard
Lesser Stitchwort	Welted Thistle
Small St. John's Wort	Ox-eye
Wood Bitter Vetch	*Winter-green
Meadow Vetchling	*Yellow Mimulus
Bush Vetch	Woody Nightshade
Lady's Fingers	Cow-wheat
*Marsh Cinquefoil	Large Red-rattle
Dogrose	Foxglove
Small Willow Herb	Wood Sage
Wood Sanicle	Selfheal
Elder	*Skullcap
†Great Valerian	Forget-me-not
Devil's-bit Scabious	Comfrey
*Ivy-leafed Lettuce	Spotted Orchis

* Somewhat rare. † Prolific growth.

The FIFTH FIELD MEETING was held on September 19th at Budle Bay and Bamburgh. The day was most brilliantly fine and hot, the attendance of members sixteen.

Leaving Belford station we at once took the road towards Waren Mill. Our attention was taken by an old tower, apparently a disused windmill, but which I have since found to be a sea mark for vessels visiting the bay, in former times a port of some consequence where a considerable quantity of grain was shipped.

The bay was reached, and the tide not being full, we took to the beach and followed the south shore, noting the mussel beds and the now disused and abandoned oyster beds, which are said to have come to an end owing to an unusually severe frost having destroyed the oysters. Soon the old and ruinous quay was reached, and here a halt was made for lunch. In the clear water shoals of small Coalfish were to be seen, and on the far side of the bay on the mudflats and sandbanks a great congregation of birds—Curlew, Gulls, a Heron, a few ducks, probably Mallard, and many smaller waders too far off to be identified, but most likely Dunlin.

We now moved on round by the beach towards Bamburgh, disturbing a pair of Redshanks on the way. When the sea beach was reached with a full view of the islands, curious mirage effects began to develop; steamers appeared to be castles with a mast and funnel on top, or the upper works of a vessel were duplicated a short distance above the real vessel. The Outer Farne appeared to have beetling cliffs crowned by a stumpy red lighthouse, and altogether the varying shapes and effects were most curious.

At the well known Stag Rocks another halt was made, and a few large Porpoises seen passing. Thence to the Crew Arms, where tea was provided; after which we set off for Seahouses station, and after something of a rush caught the train for Newcastle.

Among the birds seen the most noticeable were :—Heron, Shelldrake, Curlew, Oyster Catcher, Cormorant, Greater and Lesser Black Backed Gulls, Green and Golden Plover, Redshank, Ring Dotterel, Pied Wagtail, Swallow, House Martin, Rock and Meadow Pipits, Linnet, and Whinchat.

Among the plants found were :—

Great Spearwort	White Campion
Purple Sea-rocket	Sandwort
Watercress	Mallow
Dyer's Rocket	Wood Cranesbill
Grass of Parnassus	Dove's-foot Cranesbill
Red Campion	Hemlock Storksbill

Herb Robert	Sea Starwort
Bird's-foot Trefoil	Corn Chamomile
Hop Trefoil	Ragwort
Tufted Vetch	Knapweed
Meadow Vetchling	Yarrow
Herb Bennet	Germander Speedwell
Tormentil	Viper's Bugloss
Yellow Bedstraw	Small Bugloss
Harebell	Betony
Devil's-bit Scabious	Bugle
Bell Heather	White Dead-nettle
Centaury	Woundwort
Sow Thistle	Wild Mint
Slender Thistle	Thrift
Milk Thistle	Spotted Persicaria
Nipplewort	Goosefoot
Hawksbeard	Pellitory-of-the-wall

An exceptionally long list of flowers in bloom for mid-September.

The SIXTH AND LAST FIELD MEETING for the year was held at Seaton Delaval and Seaton Sluice on October 16th.

Leaving the train at Hartley Station, we first visited Seaton Delaval Hall, which was looked through, and the man and horse traps and other relics of a more barbarous age examined with interest. A fine view was enjoyed to the northward from the roof, and the extent of the coalfield clearly defined by the many smoky chimneys. The stables and kitchens, untouched by the fire which destroyed the main body of the building, were also looked through; and the racy comments on the various features of the place, and the legend of the theft of a pig's head by a mendicant friar, as retailed by the kitchen's presiding genius, were much enjoyed. After paying a visit to the old church, we left the hall and walked down to the sea-shore, and on the sandhills to the north of the old harbour took lunch. The harbour was next examined, with the great cut through the rock that once gave access to the sea on the east, though now in a ruinous condition.

The party were now taken in charge by Dr. Woolacott, who had kindly consented to point out the geological features of the coast. As we proceeded southwards along the shore a series of faults and whinstone dykes were clearly shown. A very interesting instance of a dyke of whin which has not reached the surface of the ground but terminates in the sandstone, is well exposed on the cliff side. The fine bands of small fossil shells known as mussel bands were also examined; and the curious formation of stone called cone-in-cone was well seen near St. Mary's Island.

The tide being low, the Island was visited, and the beds of boulder clay, with many well scratched boulders *in situ* on the mainland opposite examined; until the now rapidly failing light of the late autumn evening warned us that it was time to make for Monkseaton station, and so brought one of our most interesting day's outings to a close.

Hearty thanks were given to Dr. Woolacott for his able exposition, which added so much to the interest of the day.

Owing to the season of the year but few plants of interest were seen, nor was the ground chiefly travelled a likely spot, being for the most part on the sea beach with a bare cliff behind it; nor beyond a few of the commoner gulls and the every-day sparrow and starling were birds much in evidence.

So ended the season of 1907, which I venture to think can fairly be claimed to have been a very successful one. The Field Meetings were on the whole well attended; but as I have hinted earlier on, I believe that these expeditions might be made more useful and interesting still if a somewhat more definite programme were drawn up of the chief objects to be looked for each day, and some expert in one of the various branches of natural science were to be present to explain these to those of our members who wish for such knowledge, but whose time does not permit them to slowly find out all these things for themselves; at any rate it might serve to teach the pleasure and interest to be obtained by a systematic study of some one branch of natural history.

However, this is perhaps the duty of the president for the year; and conscious as I am of my serious failings in this respect, I can only hope that in the future the Society may be more fortunate in its selection, and that some trial may be made in this direction.

To conclude, I wish to tender my most grateful thanks for the assistance I have received in the carrying out of our programme. First to our excellent secretary for his careful and far-seeing arrangements; secondly, to the botanists and others who have supplied me with notes of plants seen, etc., which I am unable to supply myself with; and, lastly, to the anonymous contributor to the "Daily Journal," whose charming articles have proved a mine of wealth to replenish my memory in preparing this sketch of the year's doings.

REPORT ON THE FIELD MEETINGS OF THE NATURAL HISTORY SOCIETY FOR 1908.

Read April 7th, 1909, by Mr. Edward Potts, Chairman of the Field Meetings Committee for 1908.

When, twelve months ago, I received the honour of election to the chairmanship of the Field Section of the Natural History Society, it was one that certainly I never anticipated, and it was with some degree of hesitation and misgiving that I entered upon its responsibilities. However, having done so, I resolved that, so far as I could, I would do my best in the endeavour to fulfil the duties of the position, and, if possible, further the interests of the institution; and I can only now venture to hope that those interests have not materially suffered during my tenure of the office.

I was able to be present at all the Field Meetings, and I think I may report that the attendance on the whole was fairly good.

The First Field Meeting was held on Saturday, May 23rd, the district chosen being Lintz Green, and more especially the Chopwell Woods, permission to enter the latter having been granted by the authorities of the Armstrong College, who now have these woods under their control.

There was a large attendance of members and accompanying friends, doubtless attracted by the charming spring-like day, and also the fact that some time had elapsed since the Society had visited this locality.

Leaving the train at Lintz Green station, the party proceeded by a field path leading to the woods. Many of our earlier flowers were here observed, indicating the approach of summer, the hedgerows being gay with the blossoms of the Greater Stitchwort, the Dog Violet, Lady's Mantle, and other

spring flowers. Entering the woods by a steep path we passed an escarpment, interesting because (within the memory of some of the members) it was a spot where falcon and raven had reared their young.

The woods, which lie to the north of the river Derwent between Lintzford and the village of Blackhall Mill, are stated to have been the property of the Crown since the days of Queen Elizabeth, and during the later wars with France a considerable acreage was planted with oaks, in view of naval requirements. No longer required for war, these woods may yet serve a useful purpose in the interests of forestry and afforestation. The new trees now being planted are chiefly beeches, pines, and firs. Traversing this woodland district for some distance, we did not observe much of botanical interest apart from the trees, doubtless owing to the fact that a wood, by reason of its dense shade and wide-spreading roots, does not constitute a favourable habitat for plants. However, there was one very notable feature, namely the great abundance of the charming little flower *Oxalis acetosella* then in full bloom, and in association with the Wild Hyacinth and Primrose.

Arriving at Chopwell Mill, tea provided by Mrs. Cheeseman was partaken of. Owing to limited accommodation, the party became somewhat divided, thus preventing our holding a meeting that had been arranged for the examination of any specimens collected, Mr. Richard Adamson having kindly promised his assistance. Time and opportunity however were lacking, so the members retraced their way back through the woods to Lintz Green station.

Amongst the plants found in blossom may be mentioned :—

Garlic Mustard	Wood Anemone
Wood Stitchwort	Red Campion
Wood Geranium	Ground Ivy
Spring Orchid	Wood Rush
Wood Pimpernel	Bitter Vetch
Common Arum	Common Bugle

The Second Field Meeting was held at Warkworth on June 4th, the weather being all that could be desired for such an occasion, and there was again an excellent attendance of members and friends. Detraining at Warkworth station, the party proceeded to the ancient village by the lane leading thereto from the station; this, once interesting for its hedgerows bedecked with flowers, has recently been greatly altered, newly erected stone walls having taken the place of the greenery of yore. Entering Warkworth by the old 14th century bridge crossing the Coquet, we were met by Mr. Pybus, who had kindly made the arrangements for our guidance during the day, the first item being a visit to the fine old church. Here an agreeable and instructive hour was passed under the conductorship of the Vicar, the Rev. J. Fairbrother, who ably and courteously pointed out many features of archæological interest. One important item was a portion of the old Saxon church of King Ceowulph, which was discovered during a process of restoration in the latter part of the 18th century; this included a beautiful cross which has been permanently preserved in the present chancel.

After a cordial vote of thanks to the Vicar for his kind services, we then made our way to the castle, where—amid the picturesque ruins—we halted for a short while, in order that luncheon might be partaken of. That being accomplished, we descended the ravine to the border of the stream, and followed the path by its margin. Very noticeable at this point were the numerous hawthorns, then a mass of bloom, presenting a striking contrast to similar trees in less favoured situations. On the river banks many interesting plants were found, amongst which may be mentioned the white star-like blossoms of *Saxifraga granulata* growing in fine contrast with the golden yellow of *Barbarea vulgaris*.

Crossing the river by the boat (used for conveying visitors to the renowned hermitage), and continuing our walk along the northern bank of the Coquet, we came to an open part of the glade, delightful to the eye of the botanist by the unusual

profusion of wild flowers, presenting large masses of brilliant colour glowing in the bright sunshine; for example large beds of the Wild Hyacinth grouped together with the vivid crimson of *Lychnis dioica*, and then again diversified with *Veronica officinalis*, *Ajuga reptans*, and *Saxifraga granulata*, producing a scene of natural beauty and harmonious colouring to be remembered; and though we did not obtain any rarities, we were in some measure compensated for their absence by the remarkable luxuriance of the more familiar flowers, this possibly due to their sheltered position in Coquetdale.

Crossing the river again by a wooden bridge, we sauntered back to Warkworth, where tea was provided and partaken of at the Sun Inn.

A leisurely walk in the evening to the railway station brought to a close a very enjoyable day.

Flowers observed in bloom were as follows :—

Water Crowfoot	Wood Geranium
Marsh Marigold	Bush Vetch
Lady's Mantle	Meadow Saxifrage
Garlic Mustard	Wood Pimpernel
Red Campion	Wood Sorrel
Common Stitchwort	Marsh Orchid
Wood Stitchwort	

Among the birds noted were :—Black-backed Gull, Kestrel, Jackdaw, Jay, Blackcap, Sandpiper, Swift, Swallow, Cuckoo, Corn Bunting, Willow and Wood Wren; and on the shore Ring Plover with chicks.

The THIRD FIELD MEETING took place on Saturday, June 27th, the district of Allendale and Staward-le-Peel being visited. It was an ideal summer day, one of continued sunshine, and attracted a good attendance of members. Leaving the train at Bardon Mill, and crossing the Tyne by a footbridge, we proceeded along a lane in the direction of the hamlet of Beltingham. Botanical interest was speedily aroused, notably by large patches of the Vernal Sandwort in full bloom growing on the sandy banks of the adjacent stream.

On reaching Beltingham a halt was made in order to examine the old church of St. Cuthbert, described by Tomlinson as being the only one in Northumberland which is entirely of the Perpendicular style of architecture. More in keeping with our purpose were three venerable yew trees in the burial ground; these are supposed to be upwards of 400 years old; one of them a few feet from the ground measured 16½ feet in circumference. Proceeding a short distance we arrived at the entrance to the grounds of Ridley Hall, permission to enter them and traverse the woods having been kindly granted by the Hon. F. Bowes-Lyon. We were met here by the head gardener, Mr. Furlong, and under his guidance inspected several fine trees, he drawing our attention to certain minute forms of insect life, from the ravages of which some of the trees were suffering, particularly some of the beeches.

In the bright sunshine the hall, with its lawns and ornamental shrubberies, presented a charming outlook; so also did the lake near the path leading to the Ridley woods, the surface at the time being covered with the beautiful inflorescence of the Water Ranunculus, and over it ever and anon flitted dragon flies and other interesting forms of insect life.

Our way now led through the woods for some considerable distance. These were chiefly interesting for the great variety and luxuriant growth of the trees, and gave excellent opportunities to observe them in full foliage, namely, planes, birches, oaks, limes, elms, beeches, ashes, pines, chestnuts, and poplars. Ferns of various kinds and wild flowers of the sylvan type were seen in great profusion.

Crossing the stream by a rustic bridge Planky Mill was reached, when, after a brief halt, we proceeded on our final stage, the route now lying through meadows and by a pleasant path shaded with trees. Arriving at the foot of the stony and somewhat fatiguing ascent to Staward-le-Peel, we were delighted to find a luxuriant growth of the comparatively rare *Vicia sylvatica* or Wood Vetch then in full blossom.

The day being so warm, the sun so powerful when we attained the summit of the grassy plateau occupied by the ruined Peel, a prolonged rest was enjoyed, our pleasure being augmented by the extensive views of the surrounding district thence obtainable. "Why go to Switzerland?" said one of our party; and truly the prospect of the wild gorge of the Allen at this point, with its dense covering of dark pine woods, here and there relieved by the lighter greens of various woodland trees, presents such a splendid spectacle, that it is no exaggeration when Tomlinson describes it as a scene of truly alpine grandeur. Refreshed by our halt, we then made our way to Staward station; where, having partaken of tea, we entrained for Newcastle.

Many of our well known woodland plants were noted during the day's ramble, inclusive of the already mentioned Wood Vetch, which, by reason of its elegant foliage and handsome flowers, is well entitled to the premier position it holds amongst our British vetches.

In regard to bird life, the Song Thrush and Blackbird were frequently heard, and the Wren, Chiffchaff, Rook, Blue and Great Titmouse, Cuckoo, and occasionally the Redpole were also observed.

The Fourth Field Meeting, extending over three days, was held July 11th–13th, the district visited being Boston Spa and Thorpe Arch, situated in the lower reaches of the river Wharfe. This meeting was arranged mainly for botanical purposes, but unfortunately very few of our members were able to avail themselves of it. This was the more regrettable because the flora of this district is very rich, including many of our rarer plants peculiar to a limestone formation.

Leaving Newcastle on the evening of July 11th, we proceeded by way of Harrogate to the rural station of Thorpe Arch, and thence down to the Royal Hotel, Boston Spa, an ancient but partly modernized hostelry surrounded by an extensive well stocked garden, and forming one of the

attractions of the place. Next morning in due time we set forth on our work of exploration, going in the first instance to Thorpe Arch Park, in which by the kind permission of Mr. T. W. B. Matthews we were at liberty to roam at will.

The river Wharfe runs through the park, and we found its banks plentifully adorned with the Knotted Figwort and Hemp Agrimony luxuriating in so favourable a situation. Continuing the path to the margin of the river, we were soon confronted on the opposite side of the river with a bold escarpment of yellow limestone known as the Jackdaw Crag, which forms one of the items of geological interest in this district; and here may be mentioned the occurrence of a river terrace, situated on the south side of the Wharfe near to Boston Spa. This is raised about 50 feet above the stream, showing that formerly it ran at a much higher level. Continuing our walk through the park, we finally reached the Flint Mill, near which we obtained the somewhat rare plant Leopard's Bane, then in flower. Leaving the park here, we made our way to the small country town of Wetherby for the purpose of visiting a habitat of the Bee Orchid (*Ophrys apifera*), a spot where I had gathered it on a former visit. It flowers early in June, so we were unable to trace it. We found another very interesting member of the order, namely *Orchis pyramidalis*, growing plentifully in company with *Campanula glomerata*. This orchid is notable for its densely crowded spikes of brilliant crimson flowers, and for the remarkable two-fold movement of its pollinia, necessitated by the divided stigmatic surface of its pistil. This we were able to verify by experiment. Darwin, describing this wonderful contrivance to secure cross fertilization, said, "In no other plant, or indeed in hardly any animal, can adaptations of one part to another, and of the whole to other organized beings widely remote in the scale of Nature, be named more perfect than those presented by the Pyramidal Orchid."

Unfortunately our operations for the day were cut short by heavy showers of rain, so we returned to our headquarters in the late afternoon.

The following day opened with a bright sky and sunshine, so directing our steps to the village of Walton, we passed on our way Thorpe Arch station, where on the railway embankment near we were fortunate in obtaining the somewhat rare plant *Chlora perfoliata*, which grows abundantly at this spot. At Walton we hoped to obtain the very beautiful aquatic plant *Hottonia palustris*, which is occasionally found in ditches near the village; these, however, were so hopelessly overgrown with nettles, and so difficult of access, that we were obliged to abandon the quest.

The next day, having permission from Mr. G. Lane Fox, M.P., we visited Bramham Park, where the country becomes more undulating, leading to the Lendrick Hills. Here we were informed that *Atropa belladonna* might be obtained; but, alas, by this time rain had again overtaken us, compelling us to abandon our search and return to Boston Spa, which we accomplished by way of Rigton, Bardsey, and Collingham, all reputed habitats of interesting plants.

The last day of our visit proving wet, we abandoned further search and took an early train home.

One of the botanical features of this district which particularly excited our admiration was the character of the hedgerows, the usual combination of thorn, bramble, and briar being here varied with the red-tinted foliage of the maple; and ever and anon the whole was festooned for many yards with the shining leaves and curious inflorescence of the White and Black Bryony, both growing in riotous profusion.

During our three days' rambling we of course observed a great number of plants in flower (in addition to those already referred to), amongst which may be mentioned the following:—

Corn Cockle
Rosebay Willow
Ivy-leafed Lettuce
Giant Bellflower
Water Figwort
Common Gromwell
Marsh Orchid
Yellow Iris
Sand Leek

The Fifth Field Meeting took place on September 10th, Cullernose Point, near Craster, being the appointed place. The weather, though brilliant at first, 'ere train time arrived had considerably changed, resolving into cloud and rain; consequently under these unfavourable conditions only a small party of members assembled at the Central Station. As the main purpose of this meeting was geological—the object being to survey the coast of Northumberland from the mouth of Howick Burn to Cullernose Point—and as Mr. Stanley Smith, B.Sc., had come from Haughton-le-Skerne in order to conduct the party, it was decided to risk the weather, and, if possible, carry out the programme. The sequel justified this course, for happily as we travelled northward the weather improved; so that when we detrained at Longhoughton station favourable conditions prevailed. Mr. Smith, who has made a careful examination of this district, has kindly furnished me with an account of the geological features of interest he brought under our notice.

A Brief Survey of the Geology of the Coast from the Mouth of Howick Burn to Cullernose Point.

A little to the south of Howick Burn some twelve or fourteen feet of limestone crops out from beneath the sloping cliff of boulder-clay. The limestone is divided by numerous sinuous partings and abounds in latissimoid Producti. The identity of this bed is however a matter of some doubt.

Below it is a series of argillaceous and arenaceous strata, which contain a second though much thinner limestone, and a seam of coal. The thin limestone consists of two calcareous beds, nine inches and two feet respectively, separated by one foot of shale. The shore at the base of the cliff is strewn with erratics from the glacial formation, including large boulders of Cheviot porphyrite.

North of the stream a thick falsely-bedded sandstone occupies the whole of the cliff section for a distance of half-a-mile or more, and the sandstone is followed by another series

of shales, thinner sandstones and limestones. These beds display some remarkable examples of complex faulting. Brought into the section by these complicated faults, the Six Yards Limestone gives rise to a scar jutting far out into the sea, and stretches as a gentle S-fold to the bay south of Cullernose Point. The limestone, which is about twenty feet in thickness, is built up of thick courses. Latissimoid Producti are very abundant.

Close to Cullernose Point the Four Fathom Limestone appears in the cliff. The bed, about thirty feet thick, is divided by a richly fossiliferous shale into two halves. The upper half contains numerous chertose bands which stand out from the softer matrix through weathering, whilst the lower portion consists of a series of thick "posts" as in the case of the "Six Yards." Above the bed is a thick black shale (30 feet +), below it a sandstone.

The strata, which dip 10° towards the north, are faulted against a coarse sandstone or grit, the line of faulting being occupied by a basaltic dyke. The sandstone with its associated shale passes, after two or three violent contortions, beneath the Great Whin Sill, which near the junction of the igneous intrusion and the sedimentary strata has taken into itself several large masses of the latter.

Cullernose Point rises a majestic wall of basaltic columns, which stretches northwards as far as Dunstanburgh, a distance of two miles.

Though mainly geological, the day was not devoid of other interests. Botanically, this was specially manifest at Howick Burn and grounds, which, thanks to the courtesy of the Countess Grey, we were permitted to enter. The wide and marshy entrance to the burn was conspicuous by a prolific growth of the Great Hairy Willow Herb in full bloom, in the midst of which we found an extensive bed of its near relation the handsome Purple Loosestrife luxuriating in so favourable a station; also on a grassy bank near the sea was observed

a rich growth of the lovely and delicate Grass of Parnassus. Despite the lateness of the season many interesting plants, characteristic of the Northumbrian coast, were found still in bloom, such as the white Sea Campion, the Hemlock Storksbill, the Sea Rocket (this in great profusion), and the Maritime Thrift. Our ornithologists reported that bird life was not prominent on this part of the coast, the rocky formation not affording the birds the swampy feeding grounds they love.

Having spent some time in the Howick grounds, we descended to the last of the bays south of Cullernose Point, and finally struck a path which led us across two or three fields to Craster, the well-known habitation of a hardy race of fishermen. Here we were prepared to enjoy a cup of tea supplied at the old fashioned inn the Jolly Fisherman.

A pleasant walk in the evening—of some three miles—brought us to the station of Little Mill, where we entrained for home.

Amongst the plants found in bloom were :—

Common Mallow	Purple Loosestrife
Perforated St. John's Wort	Grass of Parnaasus
Meadow Cranesbill	Great Hairy Willow Herb
Rest-Harrow	Hedge Woundwort
Hemlock Storksbill	Thrift
Agrimony	

Among the birds noted were the Cormorant, Common Gull, Black-headed Gull, Redshank, Moorhen, and Stonechat.

The Sixth and last Field Meeting took place on October 6th, consisting of a ramble along the stretch of coast between South Shields and Marsden, and was of purely geological interest. There was a very good attendance of members, presumably induced by the fact that Dr. D. Woolacott, of the Armstrong College, had kindly promised to conduct the party and explain some of the leading geological features of this portion of the coast line, the interpretation of which is the result largely of his own personal investigations.

Meeting at South Shields station, we made our way to the Herd Sands and thence to the Trow Rocks, where Dr. Woolacott commenced his exposition, pointing out the evidences of a case of thrust and crush-brecciation reaching from this point to Marsden. It is unnecessary here to describe the phenomena in detail, however, as Dr. Woolacott has already published a preliminary note upon them in our own Transactions (New Series, vol. iii., p. 46), and a full account in Memoir no. i. of the University of Durham Philosophical Society.

I may say that we spent a very profitable and pleasant time. It was not only an intellectual but also a physical exercise, for it required almost the agility of a chamois to safely negotiate the slippery rocks occasionally encountered in the endeavour to keep pace with our guide.

Our survey of the coast completed, we wended our way to the well-known semi-subterranean inn at Marsden, where tea was provided, and the opportunity taken of according a vote of thanks to Dr. Woolacott for his courteous assistance.

The only birds noted during the walk were Meadow Pipit, Kestrel, Jackdaw, Skylark, and a few Gulls.

Being so late in the season, there was nothing of botanical interest to report save here and there a few belated blooms reminiscent of the waning year.

I may say that, in addition to the authorized programme, we held during the summer months a few informal meetings for botanical purposes, visits being made to Blaydon Burn, the sea banks near Horden, and Stocksfield and Bywell. These were attended by members specially interested in botany, and with good results. The success of these meetings suggests the enquiry as to whether we are deriving from our Field Meetings all the advantages that they might and ought to yield. Too much time is occasionally given to objects which more properly come under the heading of antiquarian or archæological research, also to walking long distances

over well beaten tracks. It seems desirable that the committee should exercise greater care in the choice of suitable places and in making preparatory arrangements, in order that the district or locality selected should be thoroughly explored. Perhaps we might advantageously follow the example of kindred societies, who, when a Field Meeting is fixed upon, previously map out and issue a definite programme, each section of natural history being placed under the guidance of a specialist. Thus when the party arrives on the scene of action, the various sections disperse on their several quests with the understanding that all will meet at an appointed rendezvous later on for the comparison of notes, etc. The adoption of a course of this kind might lead to a better attendance of members proficient in natural history, and thus be an inducement to young naturalists to join the Society.

In conclusion, I wish to thank our esteemed secretary, Mr. Robson, for the courteous assistance he has at all times rendered to me, and upon whose admirable press notices I have had largely to rely in the preparation of this report. And I also desire to express my appreciation of the kind reception I have met with from the ladies and gentlemen who have attended these meetings, the recollection of which will render my year of office—to myself—always a pleasurable memory.

Short Notes on some New and Rare British Collembola

By Richard S. Bagnall, F.E.S.

Early in the year 1907, recognizing the difficulty of doing original work in the Coleoptera without easy access to a large entomological library and good reference collections, and with so little time at my disposal, I commenced to collect material and literature in certain little-known and much neglected groups, chiefly the Collembola and Thysanura, and the Thysanoptera. In the first-named group I cannot pretend to have made any systematic collections, nor have I studied the forms except in a general way. Nevertheless I have had the good fortune and pleasure of finding a large number of the species then known as British, including nearly all the species recently recorded by my friends Prof. Carpenter and Mr. Evans.

Members of the Collembola are soft-bodied apterous insects, mostly minute, and as a rule furnished with a forked spring under the body, by which they are able to jump about with surprising agility, this latter characteristic earning for the species the common name "springtail." They should be collected into tubes of about 70 per cent. alcohol by means of a fine camel-hair brush.

In some notes read before the Entomological Society of London on December 4th, 1907,* I recorded *Orchesella rufescens* (Linn.), *Isotoma hibernica* Carpenter, *Proisotoma minuta* (Tullb.), *Agrenia bidenticulata* (Tullb.), *Folsomia quadrioculata* (Tullb.), *Xenylla brevicauda* Tullb., *Anurida tullbergi* Schött, and *Bourletiella cincta* (Tullb.) as British. Of these, however, *Isotoma hibernica* and *Xenylla brevicauda* had just been recorded by Prof. Carpenter from Ireland; *P. minuta* had been taken in Edinburgh and mentioned in a newspaper, but not recorded in any scientific publication

* Trans. Ent. Soc., London; Proceedings, pp. lxxx.-lxxxiii., 1907.

until 1908;* whilst *A. bidenticulata* had been discovered in Ireland shortly before by Prof. Carpenter, and is recorded in the Irish Naturalist for September, 1908. Of the other four species *F. quadrioculata* has since been taken by Mr. Evans in Scotland, whilst *Orchesella rufescens*, *Anurida tullbergi*, and *Bourletiella cincta* rest as British upon the records here given in detail.

Since then I have found three other species new to the British fauna, *Sminthurinus cœcus (forma principalis)*, *S. biflavo-punctatus* Collinge and Shoebotham, and *Spyrotheca lubbocki* (Tullb.). A variety of the first was known to us, but not the type form; the second was only figured and described this year in the Journal of Economic Biology. I had taken the species in 1907 at Glasgow; have since found it in Belgium and Norway, and believe that it is not uncommon, but has been confused with *S. igniceps*, to which species my specimens had been referred, though I felt dubious as to their identity with *igniceps*. The record of the third species, *S. lubbocki*, rests upon a single specimen.

I must add that most of my material has been kindly worked out by Prof. G. H. Carpenter, who has not only confirmed the identification of those I attempted to determine, but has identified those that were beyond me, and has helped me considerably by his kindly encouragement and advice. To my friend Prof. Carpenter, therefore, I am under a deep obligation, and can only find pleasure in having this opportunity of expressing my sincere gratitude. A good deal of interesting material has been retained by Prof. Carpenter for future study, apparently including members of the genera *Schœttella* and *Pseudachorutes*, of which no species have yet been recorded from Great Britain.

To Lord Avebury also, and to Prof. O. M. Reuter of Helsingfors, Dr. H. Schött of Upsala, Dr. C. Schäffer of Hamburg, Prof. Willem of Ghent, Dr. Walter M. (Axelson) Linnaniemi of Helsingfors, and Messrs. Wm. Evans and

* Evans, in Proc. Royal Phys. Society of Edinburgh, xvii., no. 5, pp. 195-200, 1903.

Walter E. Collinge would I tender my sincere thanks for their kindness in presenting me with their various and invaluable works and papers upon the Collembola.

Some of the most interesting records herein are due to the kindness of various friends in sending me material, and I would take the opportunity of thanking my friends Dr. A. Randell Jackson and Dr. Norman H. Joy for their kindness in this connection.

Although up to 1907 only one species of spring-tail was recorded from our counties, a very large proportion of the Collembola known to occur in the British Isles have now been found in the Northumberland and Durham area; but as I have not had the opportunity for collecting except in a very circumscribed area, and have not attempted any systematic collecting for minute forms or for forms restricted to certain conditions and habitats, I do not consider it advisable to compile a local list at the present moment, though I hope that with Prof. Carpenter's continued help and collaboration this may be done in the near future.

The classification I have to a large extent adopted is that evolved by Börner* and followed by Linnaniemi (Axelson)† and other prominent Continental entomologists. It seems to form a more natural and easier grouping than our older classification. Though I have not attempted to go into the synonymy of the species, I have included a few useful references in connection with most of the species previously unknown to us as British.

Apart from those that are here added to the British fauna, many records of rare and interesting spring-tails are mentioned, most of the species having only recently been included in our known fauna through the researches of Prof. Carpenter and Mr. Evans.

* Zool. Anz., 1900, etc.

† Die Apterygotenfauna Finlands, I. Allgemeiner Teil, Helsingfors, 1907.

Order COLLEMBOLA Lubbock

Sub-Order ARTHROPLEONA Börner

Family PODURIDÆ Lubb.

Genus PODURA L.

Podura aquatica L.

Though this species is apparently a common one, and one of wide distribution, I have seen but a single specimen, which occurred on the surface of a weed-grown pond in a wood near Winlaton early in the spring of 1906.

Genus ACHORUTES Templ.

Achorutes longispinus Tullb.

A few examples have been found in a garden at Winlaton, each occuring singly under stones embedded in the soft earth. I have also found a variety of this species amongst decaying herbage in Gibside and on decaying rhubarb leaves in a garden near Winlaton, these latter specimens being peculiar in the fact that, without exception, they were all without mucrones to the spring. Dr. Randell Jackson has found *A. longispinus* in large numbers on the surface of a pool of rain-water at Chester, whilst in June, 1907, I took two or three specimens from the surface of a tank of spring-water in a field near Tarset, Northumberland. These are the first recorded from England.

Achorutes armatus (Nic.), *A. viaticus* (L.), *A. purpurascens* Lubb., *A. rufescens* (Nic.), and a species allied to *A. schneideri* Schäff., have also occurred in the Northumberland and Durham area.

Genus XENYLLA Tullberg

Xenylla humicola (O. Fabr.).

Some time ago Miss Marie V. Lebour kindly sent me a tube of this species gathered from the shore at Stranraer, and I have since found it in large numbers at that place as well as at Girvan, Ayr, Largs, in the Kyles of Bute, and on the

east coast of Arran and the Greater Cumbrae. In England *X. humicola* has been recently found on the east coast at Saltburn, Yorkshire; Whitley Bay, Northumberland; and Roker, county Durham.

I have not yet found the closely allied *X. maritima* of Tullberg, which has been recorded from Ireland by Prof. Carpenter, and by Mr. Evans from Scotland.

Xenylla brevicauda Tullb.

X. brevicauda has only recently been recorded by Carpenter from Ireland, and is another interesting addition to our fauna. On the occasion of the Vale of Derwent Naturalists' Field Club's visit to the Chopwell woods on May 11th, 1907, I found several examples of this little bluish-grey insect lurking under the damp bark of some felled ash trees. These are the first English records for both *X. humicola* and *X. brevicauda*.

Distribution.—Sweden, Finland, Ireland, and England.

Genus FRIESEA Dalle Torre (*Triæna* Tullberg)

Friesea mirabilis (Tullb.).

This is apparently a rare European species, and it gives me much pleasure to be able to record it from the Northumberland and Durham area. Early in the spring of 1907 I found several specimens under the loose bark of some small birch and ash logs lying in a marshy spot at Lockhaugh, near Rowlands Gill. This is the first English record.

Genus ANURIDA Laboulb.

Anurida Tullbergi Schött, 1892.

Anurida Tullbergi Schött, Entomol. Tidsskrift, Stockholm, p. 192, 1892; Kongl. Svenska Vetenskaps-Akad. Handl., xxv., p. 91, pl. vii., figs. 17–18, Stockholm, 1893.

In the spring of 1907 I discovered this interesting little creature living in large numbers amongst the shingle by the Derwent side at Winlaton Mill, and under submerged stones.

Many examples were also found congregated together on the surface of some quiet pools near by. It is evident that the habits of *A. tullbergi* resemble those of *A. maritima*, with the exception that the former is a riparian insect and *maritima* purely maritime. A solitary spring-tail found by the Derwent side near the Paper Mills at Lintzford on the occasion of the Vale of Derwent Naturalists' Field Club's meeting in the Chopwell woods, May 11th, 1907, is also referable to *A. tullbergi*, whilst since then I have found the species plentifully at the Ladies' Steps near Swalwell, and in the autumn of 1908 took a single specimen by the river side at Wylam-on-Tyne. *Anurida granaria* and *A. maritima* also occur in our northern counties.

British Distribution. — Wylam-on-Tyne, Northumberland; and Swalwell, Winlaton Mill, and Lintzford in the Derwent Valley, county Durham. The species is recorded from Sweden (Schött), Finland (Reuter), and from Florida (Coll. Einar Lomberg).

Family ENTOMOBRYIDÆ Dalle Torre.

Sub-Family ISOTOMINÆ Schäffer

Genus FOLSOMIA Willem.

Folsomia quadrioculata (Tullb.).

Isotoma quadrioculata Tullberg, Ofvers. af Kongl. Vetenskaps-Akad. Forhandl., xxviii., p. 152, 1871.

A minute grey spring-tail found amongst dead leaves in a wood by the Derwent side in the spring of 1907 has been identified as this species by Prof. Carpenter, and is an interesting addition to the British fauna. In April, 1908, my friend Mr. Evans found numerous specimens of *F. quadrioculata* living in some growing tufts of moss and *Sedum anglicum* from the Isle of May.

Since it was described by Tullberg from Sweden *F. quadrioculata* has been recorded from Finland, Germany, Bohemia, etc.

F. fimetaria (L. Tullb.) is apparently common and widely distributed in our islands, and it is probable that many other interesting species of this group will yet be discovered when more general attention is paid to the minute forms.

Genus PROISOTOMA Börner

Proisotoma schœtti Dalle Torre (*litoralis* Schött).

This is another northern species, and has been regarded as a truly litoral insect. Mr. Evans first found it in Britain on the beach between Leith and Portobello, January, 1899, and later in the same year found it commonly along the edge of Methven Bog, an inland locality.

In the autumn of 1908 I found *P. schœtti* abundantly in a manure heap in Axwell Park (this being its first reported occurrence in England), and with it a peculiar spotted *Achorutes*, which latter, Prof. Carpenter tells me, is closely allied to *A. schneideri* Schäffer, a species not yet recorded from the British Isles. I have already stated that *P. schœtti* is usually regarded as a sea-shore species, and on that account it is interesting to note that I had previously taken the same *Achorutes* from rotting sea-weed at Stranraer and at Tighnibruaich in the Kyles of Bute, July, 1907. It is probable that many of the species regarded by us as litoral may be found wherever conditions show excessive salinity.

Proisotoma besselsi (Packard) (= *Isotoma spitzbergenensis* Lubbock).

Amongst dried seaweed at Whitley Bay, Northumberland, and Saltburn, Yorkshire. It is a minute and active creature, jumping strongly and with great rapidity. These are the first English and most southerly localities recorded.

Proisotoma minuta (Tullb.).

Isotoma minuta Tullberg, Ofvers. af Kongl. Vetenskaps-Akad. Forhandl., xxviii., p. 152, 1871.

This very minute species is another interesting addition to our fauna. In the winter of 1905–06 several springtails were

found in the hydrants and cisterns of the city of Edinburgh, causing much alarm. These were submitted to Mr. Evans for identification, who reported that the commonest form was the blind *Folsomia (Isotoma) fimetaria*, but in one phial he discovered about a score of *F. minuta*.* Prof. Carpenter refers a single specimen taken in dried seaweed on the beach at Whitley Bay in the spring of 1907 to this species, and it gives me much pleasure to be able thus to record its occurrence locally.

Genus ISOTOMA Bourlet

Isotoma hibernica Carpenter.

Isotoma hibernica Carpenter, Scientific Proc. Royal Dublin Soc., xi. (n.s.), p. 40, pl. ii., figs. 1–7, 1906.

This is a large form, most closely resembling the common *I. viridis*, but easily distinguished by the long spring, which, when set, reaches to the bases of the intermediate pair of legs, by the arrangement of the ocelli and the relative lengths of the antennal segments. Dr. Jackson has taken this interesting springtail on two occasions in Delamere Forest, together with another large and equally interesting creature, *Orchesella rufescens* (Linn.), my identification of both these insects being confirmed by Prof. Carpenter. *I. hibernica* was discovered by Prof. Carpenter in the June of 1905 on the shores of Lough Melvin, County Leitrim, and described and figured by him a few months later. I know of other records.

I. cinerea (Nic.), *I. sensibilis* Tullb., *I. viridis* Bourl., *I. grisescens* Schäff., and *I. palustris* (Müller) occur in the counties of Northumberland and Durham.

Genus AGRENIA Börner

Agrenia bidenticulata (Tullb.).

Isotoma bidenticulata Tullberg, Ofver. af Kongl. Vetenskaps-Akad. Forhandl., xxxiii., no. 5, p. 35, pl. ix., figs. 17, 18, 1876; *Agrenia bidenticulata* Carpenter, Irish Naturalist, xvii., p. 176, figs. B, 1–4, 1908.

* Proc. Royal Phys. Society of Edinburgh, xvii., no. 5, p. 197, 1908.

In 1907 Prof. Carpenter recognised *A. bidenticulata* from three of the Irish provinces, Munster, Ulster, and Leinster, and shortly afterwards I sent him examples collected from under half-submerged stones in the Tarset Burn, near Tarset, Northumberland, which he identified as that species. *A. bidenticulata* is a true arctic and alpine insect, having a wide range in arctic and northern regions, and is, perhaps, one of our most interesting additions to the British fauna, suggesting, as it does, a relic of the ancient glacial fauna. Schäffer* states that the *Isotoma lanuginosa* described by Carl† from the Swiss Engadine is referable to *bidenticulata*. Prof. Carpenter gives an interesting account of this insect and its distribution, etc., in the Irish Naturalist, September, 1908, pointing out that the Irish specimens are remarkable on account of the elongation of the spring, antennæ and legs. In fact he regards them as the type of a distinct variety (var. *elongata* Carp.), the specimens from England and Scotland being somewhat intermediate between the variety and the typical form.

After finding *A. bidenticulata* in England I searched specially for it in Scotland, and in July, 1907, discovered it in very large numbers below the Greta Falls, near Largs, and in Glen Ashdale, Whiting Bay, Isle of Arran, the latter specimens occurring below the beautiful Glen Ashdale waterfall, and at a height of only a few feet above sea level. In July, 1908, I again found the species on the Nethy, Nethy Bridge, Inverness-shire, whilst my friend Mr. Evans has only recently recorded a specimen of this species taken in the glen of the Kelty, near Callander, on September 17th, 1906.‡

A. bidenticulata should be searched for amongst shingle and under half-submerged stones in our hill streams.

* *Fauna Arctica*, Jena, 1900, p. 247.

† Revue Suisse de Zoologie, vi., 1899, pp. 307-310.

‡ Proc. Royal Phys. Society of Edinburgh, xvii., no. 5, postscript, p. 200, 1908.

FAMILY ENTOMOBRYINÆ Schäffer

GENUS ORCHESELLA Templeton

Orchesella rufescens (Linn.) Lubbock.

Though this is a widely distributed European species, and is a common one in many countries, it is only now that we are able to record it as a British insect. In the spring of 1907 Dr. Randell Jackson found *O. rufescens* not uncommonly in Delamere Forest. One or two other species of Orchesella not yet known as British may be expected to occur in our islands.

GENUS ENTOMOBRYA Rondani

Certain members of this genus rank as the commonest and most ubiquitous of all springtails. I have not yet collected much material in the genera *Entomobrya*, *Orchesella*, etc., but am able to record *O. cincta* (L.), *O. villosa* (Gey.), *E. lanuginosa* (Nic.), *E. marginata* Tullb., *E. multifasciata* Tullb., *E. nivalis* (L.), *E. muscorum* (Nic.), and *E. albocincta* (Templ.), from the Northumberland and Durham area.

GENUS SIRA Lubbock

Sira buski Lubbock.

Not uncommon in greenhouses, Winlaton, Newcastle, Kew, and Glasgow.

GENUS CYPHODERUS Nicolet

Cyphoderus albinos Nic.

This bustling little blind species is common wherever I have searched for it in the counties of Northumberland and Durham, inhabiting the nests of the smaller ants, *Myrmica rubra*, *Lasius niger*, *L. flavus*, and *Formica fusca*, apparently favouring the runs and burrows of *Lasius flavus*.

GENUS LEPIDOCYRTUS Bourlet

Lepidocyrtus curvicollis Bourlet.

A very fine though little known insect, of which I possess an example found in a rubbish heap at Winlaton in the autumn of 1908.

Genus HETEROMURUS Wankel

Heteromurus nitidus (Templ.).

I believe that this species, better known to British entomologists as *Templetonia crystallina* Lubbock, is common and widely distributed. I have often seen it, but have collected and examined specimens on a few occasions only, these being from Winlaton, county Durham; Matfen and Newcastle, Northumberland; Ayr and Abbotsford, Scotland.

Heteromurus cavernicolus (Carp.).

Sinella cavernicola Carpenter, Irish Naturalist, iv., pp. 25–35, pl. 2, 1895; *Templetonia cavernicola* Carpenter, *l.c.*, vi., p. 229, pl. 2, figs. 2–5, 1897.

Much interest has recently been aroused amongst entomologists by the results of Dr. Norman H. Joy's work with the nests of the various birds and mammals, whereby he discovered several new and rare beetles previously unrecorded as British. The most interesting captures were made by searching the underground nests of the common mole, and Dr. Joy kindly submitted to me a few springtails and woodlice which he had collected in moles' nests near Reading. Amongst these were the little blind woodlouse *Platyarthrus*, a dweller in ants' nests; the minute and blind *Sminthurinus cœcus*, and the cave-species *Heteromurus cavernicolus*, described by Carpenter in 1895, which is also blind. Two other blind springtails, *Lepidocyrtus* sp., and what I believe to be *Pseudosinella cavernarum* (Moniez), were also present.

Mr. Evans has recorded both *Pseudosinella cavernarum* and *Sminthurinus cœcus* from an old limestone mine—a subterranean quarry—at Moredun Mains, near Gilmerton, a few miles south of Edinburgh, *S. cœcus* also occurring in the Mitchelstown Cave. Later Mr. Evans found several examples of *S. cœcus* in the nest of the common red ant *Myrmica rubra* in the Clyde district, whilst I have seen it in a nest of an imported ant *Wasmannia auripunctata* in a hothouse in the Kew Gardens, London. In his latest paper Mr. Evans makes

a most interesting note on the occurrence of *Pseudosinella cavernarum*, which he found commonly in the burrows of bees *(Andrena)* and in worm holes on the banks of the Tyne at Ormiston.

In his first paper on the fauna of Mitchelstown Cave, Ireland, Prof. Carpenter makes the suggestion that the same species might be independently developed in two widely separated caves. The researches of Prof. Moniez would seem to support that theory; but these blind and so-called cave-species are now being found in many dark habitats, such as underground burrows and nests, and one must, I think, favour the alternative and more generally accepted theory.*

Before coming to any decision on such important questions, however, further material (both from above and below ground) must be studied, and as Prof. Carpenter has already suggested, further researches made both into the structure and distribution of the species and allied forms.

Sub-Order **SYMPHYPLEONA** Börner

Family SMINTHURIDÆ Lubbock

Sub-Family SMINTHURIDINÆ Börner

Genus SMINTHURIDES Börner

Sminthurides malmgreni (Tullb.), var. *elegantula* Reuter.

Found on the surface of standing water. My examples are from a pond in the hills above Millport on the Greater Cumbrae, from a brackish pool near St. Mary's Island, Whitley Bay, and from a brackish ditch near the Greatham saltmarsh, County Durham. On each occasion *S. aquaticus* and *Bourletiella novemlineatus*, var. *insignis*, were also taken. Not previously recorded from England.

Sminthurides violaceus (Reuter).

On garden paths, Winlaton. Another addition to the English fauna.

* See Carpenter, *Irish Naturalist*, October, 1897.

Genus SMINTHURINUS Börner

Sminthurinus cæcus (Tullb.) *forma principalis.*

The type form of this species, hitherto unrecorded from our islands, occurs not uncommonly under flower pots in a house at Hylton, near Sunderland, and examples sent me by Dr. Norman H. Joy collected by him from moles' nests in Ayrshire would also appear to be referable to the type form.

I have taken the var. *attenuatus* Carpenter and Evans, in hot-houses in Glasgow, London, Newcastle, Alnwick, Wylam-on-Tyne, and Winlaton; these English records being the first.

Sminthurinus niger (Lubb.)

In greenhouses, Newcastle and Wylam, and a solitary specimen in an old garden at Ayr.

Sminthurinus aureus (Lubb.)

Apparently common throughout the year amongst dead beech leaves, Gibside.

Sminthurinus igniceps (Reuter).

A few examples from the Botanical Gardens, Glasgow, and from a hot-house in Leazes Park, Newcastle-upon-Tyne, these latter making another addition to the English fauna.

Sminthurinus biflavopunctatus (Collinge and Shoebotham, 1909).

Sminthurus biflavopunctatus Collinge and Shoebotham, Journal of Economic Biology, iv., no. 1, p. 9, pl. III, figs. 1–7, 1909.

A hot-house species, which from its relationship to *S. igniceps* would seem to be referable, under our present classification, to the genus *Sminthurinus*. Nearly two years ago I found *S. biflavopunctatus* commonly in hot-houses of the Botanical Gardens, Glasgow, and have since seen it in

Belgium and Norway; my identification of the British specimens having been confirmed by Mr. Collinge. It was only described early this year.

Sminthurinus quadrilineatus (Tullb.), var. *ochropus* (Reuter).

Amongst dead leaves, Gibside. This is the only English record.

Sub-Family SMINTHURINÆ Börner

Genus BOURLETIELLA (Banks)

Bourletiella cincta (Tullb.)

Sminthurus cinctus Tullberg, Ofvers. af Kongl. Vetenskaps-Akad. Forhandl., xxviii., pp. 145, 187.

On June 26th, 1907, I obtained this very distinct little creature in large numbers by beating *Spiræa* and *Mentha* in a marshy wood near Winlaton Mill, and a few days later found it at Gibside, where it also appeared to be locally common. Since then I have found a single specimen near the Greta Falls, Largs, and recently whilst I was examining some *Euphorbia* which was kindly sent me by Miss Winifred Martin from Newton Abbot, Devonshire, several of this species jumped out.

British Distribution.—Derwent Valley, county Durham; Newton Abbot, Devonshire; near Largs, Scotland.

Bourletiella hortensis (Fitch) (= *pruinosa* Tullb.)

A single specimen from Gibside, June, 1907, is the only English example known.

Bourletiella pallipes (Lubb.)

Several specimens occurred by beating *Spiræa* and *Mentha* in a marshy wood near Winlaton Mill, June, 1907, and later on I found it more or less commonly by beating the flowers of *Potentilla tormentilla* in the same locality. Axelson treats *pallipes* as a variety of *bicincta* (Koch, Reut.).

Bourletiella bilineata (Bourl.).

On heather and heath, Greater Cumbrae, Colintraive in the Kyles of Bute; Nethy Bridge, Inverness-shire; Alnwick, Haydon Bridge, and Corbridge, Northumberland; and Gibside, county Durham. I have this September found it in numbers on the banks of Loch Lomond at Rowardennan.

Bourletiella novemlineata (Tullb.), var. *insignis* (Reut.)

By beating sedges, etc., and on the surface of brackish water, Greater Cumbrae; Whitley Bay, Northumberland; and Greatham, county Durham.

I find pleasure in being able to record this species from England.

Genus SPYROTHECA Börner

Spyrotheca Lubbocki (Tullberg), 1872.

Sminthurus Lubbocki Tullberg, Sveriges Podurider, p. 38, 1872; *Sminthurus poppei* Reuter, Abhandl. Naturw. Ver., Bd. 9, Heft 2, 18, Bremen, 1885.

This fine species is figured by Schött in his "Zur Systematik und Verbreitung palæarctischer Collembola" (pl. 111, figs. 1–4)*, and is recorded from Sweden, Finland, and Germany. In July, 1907, I took a single example by beating heather on the hills above Colintrave in the Kyles of Bute, Scotland, which, so far as I am aware, is the only British example known.

* Kongl. Svenska Vetenskaps-Akad. Handl., xxv., no. 77, pp. 1–100, pl. i.–vii.

An Arachnid from the Coal Measures of the Tyne Valley

By E. Leonard Gill, M.Sc.

A fossil arthropod of great interest has recently (April, 1909) come into my possession. It is in a clay-ironstone nodule from the brickworks near Crawcrook, on the south side of the Tyne above Ryton. Such nodules occur there abundantly in certain Coal Measure shales at about the horizon of the Low Main coal seam. Many of them contain well preserved fossils, the commonest being fronds of *Neuropteris gigantea*. Sphenopteris and other fern (or fern-like) fronds are found more rarely; and sometimes the split nodules show a miscellaneous aggregation of vegetable matter in small fragments. Animal remains seem to be quite scarce. Apart from this arachnid I have seen only a Nucula shell and some fish-scales, the latter much resembling scales of *Strepsodus sauroides* from Coal Measure shales. The workmen told me of a "hairy worm" found in one of the nodules, which had however been lost. This may have been an annelid or a myriapod, but it is perhaps at least as likely that it was a narrow Lepidostrobus cone. I have seen one large and finely preserved Lepidostrobus in a nodule from Crawcrook.

It is worth noticing that ironstone nodules from Coal Measure beds in many parts of the world have yielded a very considerable number of previously unknown arthropods. But it seems also to be the case very generally, as in the present instance, that these remains, even where they do occur, are found extremely sparingly. Almost more often than not only one or two isolated examples of any particular form have been found.

Except in a few localities, such as Commentry in France and Rakonitz in Bohemia, arthropods of any kind* are comparatively speaking of very scarce occurrence in the Coal Measures. Insects are probably found more often than arthropods of any of the other groups, and of insect remains

* This statement is not intended to apply to minute aquatic forms such as Ostracods.

the wings of cockroaches are the least rare. Of this nature are the only arthropod fossils hitherto known from the Northumberland and Durham coal field; a few fragments of cockroach wings were found in some Upper Coal Measure shales on the banks of the Wear near Sunderland, and are now in the Hancock Museum.

But rare as are insects, and the higher crustacea too, in the Coal Measures, they are common in comparison with arachnids. Scarcely a dozen specimens altogether appear to be on record for Britain. Some of the coal fields of Bohemia, Germany, and the United States have, it is true, proved much more productive in respect of fossil arachnids than our own, and a remarkably interesting body of information is now available concerning the arachnid fauna of the coal period, in particular through the admirable studies of Prof. Fritsch. But the fact remains that arachnids of any sort are among the rarest of Coal Measure fossils, and that this is especially the case in Britain; whilst from the coal field of Northumberland and Durham no fossils of this nature have ever been recorded previously.

The Crawcrook specimen belongs to a group which has long* been known as the Anthracomarti (corresponding with the Meridogastra, Thorell, of Fritsch's classification†). As weeded out by Fritsch this group constitutes a primitive sub-order of the Opiliones or Phalangidea, the familiar long-legged "harvest-spiders."‡ Fritsch (*loc. cit.*) recognizes as belonging

* Since 1882. See F. Karsch, Ueber ein neues Spinnenthier aus der schlesischen Steinkohle und die Arachniden der Steinkohlenformation überhaupt. Zeitsch. d. deutsch. geol. Ges., vol. 34 (1882), p. 556.

† A. Fritsch, Palaeozoische Arachniden, pp. 31, 55, Prag, 1904.

‡ This view of the relationship of the Anthracomarti is not shared by two of the highest authorities upon the existing arachnids, Dr. H. J. Hansen and Dr. W. Sörensen of Copenhagen. In their work "On two Orders of Arachnida" (Cambridge, 1904) they discuss the Anthracomarti and conclude that the group should be dropped altogether until more is known of the forms composing it. At that time, however, they had not seen Fritsch's work on the Palæozoic Arachnida, in which a wealth of previously unobserved detail is described. Prof. Fritsch himself has no hesitation in associating the Anthracomarti (Meridogastra) with Opiliones; he even speaks of most of them as Trogulids. Further, there are two Carboniferous genera, *Nemastomoides* and *Dinopilio*, which he considers, apparently with excellent reason, as belonging to the Opiliones veri.

to it fourteen genera with twenty-four species, grouped in four families. The special interest of the example from Crawcrook, apart from its being a type of fossil hitherto unknown from our coal field, lies in the fact that it is very probably a representative of one of the least known and most recently described genera of Anthracomarti—the genus *Anthracosiro*, founded by Pocock* in 1903. A further point of interest is that this specimen seems to show the ventral surface; not only in the previously known examples of the genus in question, but in nearly all the Anthracomarti that have been found, it is the dorsal side that is shown.

The fossil exhibits a cephalothorax, an abdomen, and parts of certain appendages. The cephalothorax is in a rather rough state of preservation. The abdomen on the other hand is well preserved. The appendages, in so far as they are represented at all, were originally almost entirely buried in the matrix of the nodule, and it has not been possible to expose them by any means perfectly or completely. The total length of the body is 20 mm. (cephalothorax 6·5, abdomen 13·5); the greatest width of the cephalothorax as here exposed is 6·5 mm., and of the abdomen 8·5 mm.; but the full width of the abdomen was probably 11 or 12 mm.

I have been in some doubt as to the precise aspect shown by the fossil. I am inclined to think, however, that the nodule has split in such a way as to expose for the most part the inner side of the ventral integument. If this be the true reading of it, we look upon it from the dorsal aspect, but see details belonging chiefly to the ventral. A good many Anthracomartid fossils have been described from time to time as showing the ventral side, and in most cases it has proved eventually that they have been so described in error, the mistake having arisen through certain structures of the under-side appearing as imprints through the dorsal plates. It will be well, therefore, to state the grounds upon which I conclude that the parts here exposed are really those of the under surface. These grounds

* R. I. Pocock, A New Carboniferous Arachnid, Geol. Mag., 1903, p. 247.

are as follows. Though the cephalothorax is convex, clear imprints of the coxæ are bulged up through it on one side. The anal ring is too sharply marked to be a mere impression showing through the integument. The abdominal plates are undivided, the transverse median pieces not being separated by sutures from the oblique side-pieces as they are on the dorsal side of *Anthracosiro* and other Anthracomarti. And further, in cases where the ventral details are showing through the dorsal plates they are mixed with details of the dorsal surface, none of which can be recognized here. My chief reason, on the other hand, for supposing that we are looking upon the *inner* surface of the ventral integument is that the body is distinctly overlying the legs. In the cephalothorax, too, there is a border of integument enclosing the impressions of the coxæ outside and pretty plainly overlying them. And there are various points, especially the relief of the borders of the abdominal plates, which tend to show that it is the inner surface that is exposed rather than a negative impression or natural cast of the outer surface.

In size and general shape the Crawcrook specimen agrees fairly closely with *Anthracosiro woodwardi* Pocock, and may possibly be a further example—the third—of that species. The other two were found in clay-ironstone nodules near Dudley in the Staffordshire coal field, and are now in the British Museum. They have been fully described by Pocock*. The present specimen differs so much from them in details of aspect and exposure, however, that it is impossible to describe it merely by comparative references to Pocock's account and figures. It is therefore described below part by part.

The *cephalothorax* is a good deal crushed. It is strongly convex†. The precise outline cannot be traced with perfect certainty all round; it appears to be roughly semicircular but somewhat angulated in front, nearly parallel-sided or slightly

* R. I. Pocock, Geol. Mag., 1903, pp. 247, 405.

† See remarks on distortion of abdomen, p. 515, for a possible explanation of the convexity of the cephalothorax.

constricted behind. The relief of the cephalothorax is mainly related to structures on the ventral surface; there is nothing suggestive of a carapace such as that of Pocock's *Anthracosiro fritschii*, which he takes to be characteristic of the genus, except that to the right of the middle line near the front there is a tubercle much resembling the eye of that species. Its position is seen in fig. 7. On the left side raised impressions of four coxæ are conspicuous, their outer edges enclosed by a line of integument forming the margin of the cephalothorax on that side. The last coxa appears to have been longer than the others, as it frequently is in allied forms, and to have overlapped the anterior border of the abdomen. The right side of the cephalothorax is in a rougher state and its detail cannot be interpreted with certainty; but some irregular ridges with a generally radial disposition no doubt mark the positions of the coxæ on that side also. Seen in the light in which the drawing reproduced in fig. 2 was made there is little sign of symmetry in the cephalothorax; but with the light falling on it from behind, the structural details shown in fig. 7 appear. There is a central, somewhat rounded mass, from which ridges radiate between the coxæ. The whole presumably represents part of the chitinous strengthening of the sternal area; of an actual sternum there is no recognizable trace. The shape given to the sternal area enclosed by the coxæ in the restored outline (fig. 4) is that suggested by the fossil, but it is naturally very largely guesswork. The hindermost portion of the cephalothorax is formed by a straight, flattened, transverse strip, an arrangement which is very common among the Anthracomarti.

The *abdomen* is united to the cephalothorax by the whole width of its anterior end. In general shape (see fig. 4) it is an oval, with the broader end to the rear. On a first inspection the fossil itself gives an impression of a nearly parallel-sided abdomen, but a closer examination shows that this is misleading. At the posterior end the border, though seemingly clean-cut, is not complete all round, as is seen on comparing the parts of the segments to right and left of the anal valve.

By making use of the imprint borne by the other half of the nodule it is possible to trace a practically complete outline on the right side, and a restoration based upon this gives the shape shown in fig. 4. The whole, or almost the whole surface of the abdominal plates is finely granulate. This is perhaps inconsistent with the supposition that it is the inner surface; but it must be noted that the pustules forming the granulation are very small indeed. (In the cephalothorax also there are small areas of similar granulate integument). A strong ridge runs nearly down the centre of the anterior abdominal segments (see figs. 2 and 3) and certainly gives this part of the fossil the appearance of being the dorsal surface. It may, however, be explained in another way. Just as the imprint of ventral structures is so commonly produced on the dorsal plates, the moulding of the dorsal plates may doubtless be imparted to the ventral. Now in *Anthracosiro* and several other related genera there is a ridge or keel down the centre of the back; in *Anthracosiro* it is described by Pocock as consisting of a series of median triangular crests, one on each tergite (fig. 5). The ridge present in this specimen is exactly such as might be produced in such a case in the ventral plates, when the internal tissues decayed and the pressure brought the dorsal and ventral integuments together. If, as was probably the case, the dorsal integument was the stronger, it would be the dorsal integument that would give its shape to the fossil in so far as the latter was not flattened out altogether under the pressure; the ventral integument would in fact be forced up into the dorsal as into a mould. The same supposition would account for the convexity of the cephalothorax. The ridge ends abruptly in the sixth segment, and behind that point the abdomen presents a shallow, even concavity. The wrinkles about the middle of the right side are no doubt produced by some accident of fossilization; and there has also been some distortion of the outer margin of the plates, for whereas this margin is somewhat turned up (concave) on the right side, on the left it is bent down sharply into the matrix. Where the margin of the abdominal plates is

well preserved it appears as a narrow rounded thickening or 'bead.'*

The segmentation of the abdomen is clearly and strongly marked. There are eight obvious segments, in addition to the rounded anal plates. Segments 1 to 7 are subequal in length (antero-posteriorly), the second being slightly the longest, and those behind it showing a certain gradation. The hind borders of segments 2, 3, 4, and 5 are markedly raised and thickened, especially towards the middle line†. The hind borders of segments 6 and 7 are not thickened: they are clear-cut and finely granulated, the granules, otherwise scattered, being ranged along the sutures in an orderly row. The most striking characteristic of the abdominal plates in comparison with those of most Anthracomarti is, however, the fact that in each of them the median portion is straight transversely and the side-pieces (lateral laminæ) are also straight, though inclined obliquely backwards. So that where these laminæ are developed (segments 4 to 8) the segments are sharply angulated, whereas in nearly all Anthracomarti they are curved, the laminæ following out the line of the median plate (see fig. 6, in which a typical Anthracomartid is represented in outline). The lateral laminæ are not marked off by sutures or in any other way from the median portions of the plates. This is one of the chief reasons for regarding the plates as those of the ventral surface, for it appears to be very generally the case in the Anthracomarti that whereas the tergites and their laminæ are separated by sutures, the sternites and the corresponding ventral laminæ are not so separated, but form in each segment a single undivided plate.

* A somewhat similar beaded edge in *Kreischeria*, another genus of Anthracomarti, is regarded by Fritsch as a row of reduced pleural plates such as form a fringe round the abdomen in certain genera (e.g. in *Anthracomartus*).

† The thickening of the hind borders of some of the segments is perhaps a further difficulty in accepting the view that it is the internal surface of the plates that is shown. Prominent hind-borders to some of the abdominal sternites are a characteristic of many modern Opilionids, but I am unable at present to say whether in their case these plates have also thickened edges internally.

The first segment bears a structure which, judging by analogy with other related forms*, must be connected with the genital orifice. It consists of two rounded ridges close behind the anterior border of the segment and parallel to it, not, however, extending across the whole width of the segment, and seeming to bend forwards at their outer ends. The front ridge of the two is sunk or broken near the middle, but the break may not be a part of its original structure. More doubtful are a pair of structures on the second segment, just possibly marking the position of spiracles. A slightly sunken area on each side cuts into the posterior border of the first segment towards the side of the body, sharply margined in front but with no definite boundary behind. That on the right is much the more definite of the two, the left side of this segment being rather damaged.

The interpretation of what is seen of the anal plates in this specimen presents several difficulties. The arrangement of these parts that is typical in the Anthracomarti is shown in fig. 10, where *a* represents the dorsal and *b* the ventral surface. The plates are marked in this figure in accordance with the views as to their homologies worked out by Pocock†. It will be seen that according to his interpretation the dorsal plate (tergite) of the eighth segment folds round the end of the abdomen between the lateral laminæ of the corresponding ventral plate (sternite); and that he takes the annular plate encircling the anus to be the ninth segment, and the anal valve (operculum anale) itself to be the tenth‡. This reading of the parts shown in the anal region of the Anthracomarti derives some support from the results of Hansen and Sörensen's work on the Cyphophthalmous Opiliones, a group which has been supposed (though not by these authors them-

* See Fritsch, Palaeozoische Arachniden, text figures 41B, 48B, 66A.

† R. I. Pocock, Eophrynus and Allied Carboniferous Arachnida. Geol. Mag., 1902, pp. 439, 487; see especially pp. 443–8, and figs. 1 and 2, pp. 490–1.

‡ Pocock at first regarded the anal valve in *Eophrynus* as the tergite only of the tenth segment, but later he found reason to believe that both tergite and sternite were represented in it. See Geol. Mag., 1903, pp. 250–1, and fig. B, p. 248.

selves) to be nearly related to the Anthracomarti. They state definitely* that "the abdomen in Cyphophthalmi consists of nine complete segments besides operculum anale . . . . We consider operculum anale in all Opiliones as a terminal segment of which only the dorsal part is developed." The likeness in respect of these features between the Cyphophthalmi (Sironidæ) and the Anthracomarti was pointed out in 1890 by Haase†. The homologies of the anal plates are not discussed by Fritsch, who remarks that these plates presumably represent two segments, but that their origin is so complex and doubtful that the investigator can interpret them pretty much according to his fancy‡.

The difficulties that arise in the attempt to homologize the anal plates of the Crawcrook arachnid will be understood from fig. 9, where this region of the fossil is shown diagrammatically with the plates marked in accordance with Pocock's conclusions, for comparison with fig. 10*b*. It will be seen that there is a general correspondence in the arrangement of the parts, but that the anal plates are situated relatively further forwards; and in consequence the outer plate, the supposed ninth segment, apparently obliterates the median portion of segment 8. If this be really the inner surface of the integument it is of course possible that the external, the true ventral, surface might show a different arrangement; that there might, for example, be on the outside some trace of a median piece connecting the two lateral laminæ which are all that is here seen of the eighth sternite. But in any case it is plain that this sternite cannot here, as in most other Anthracomarti, be as complete as those that precede it (cp. fig. 10*b*). The outer boundary of the supposed ninth segment is perfectly clear on the right side; on the left and behind it is much less definite. The anal valve itself has as usual a double border. Its inner margin is very sharply marked, which could hardly be the

* H. J. Hansen and W. Sörensen. On two Orders of Arachnida, pp. 9–10, Cambridge, 1904.

† E. Haase. Beiträge zur Kenntniss der fossilen Arachniden. Zeitsch. d. deutsch. geol. Ges., vol. 42, p. 629.

‡ A. Fritsch. Palaeozoische Arachniden, p. 56.

case if it were merely an impression showing through the dorsal plates; and its centre is in the form, not of a raised plate but of a sunken pit, as would be natural on the inner side of the integument.

The *appendages* are a striking feature of the specimen. Unfortunately most of them are tilted in such a way that they present only their edges to the surface. In the nodule as it split originally nothing at all was showing of the legs but these edges; in the case of the first three legs on the left side it has been possible, however, to chip away the matrix sufficiently to give some idea of what the joints actually preserved are like. The removal of the matrix has left these joints lying in little pits, which for the sake of clearness are not represented in the drawings. No clearing of the appendages has been attempted on the right side; from the position of the parts and the nature of the matrix it would probably not be successful.

As to the two first pairs of appendages nothing definite can be stated. The whole carapace is surrounded by an irregular mass of darkish matter, parts of which in certain lights look as though they might be the crushed remains of appendages. Projecting forward from this mass to the left of the middle line in front is a much more definite structure which is very probably part of the pedipalp of that side. Its actual appearance is represented in fig. 2. It is slender, about one-fifth the length of the animal, and terminates in what looks like a biramose portion pointing outwards. The forked appearance of this distal piece is probably an accidental effect, due to a longitudinal groove in the joint; the proximal part of the appendage was probably at least as broad as this joint. There is nothing that can be identified in any way as the remains either of the other pedipalp or of the chelicerae. The dark elongated object pointing forward in front of the fossil has, I believe, no connexion at all with it. It shows no arthropod structure, and on the other hand it resembles exactly the little blades of vegetable matter that often occur abundantly in these nodules at Crawcrook.

Portions of all the four legs are seen on each side. But as already explained, it is only on the left that it has been found possible to expose them with any degree of completeness; indeed even on that side it is only two limbs (one joint in each) that give much idea of their true form. It is clearly the same joint that is showing in each leg, and this joint I take to be the femur. The coxæ do not appear to have projected beyond the carapace; and between them and the joints exposed there are in several cases knotty masses which might conceivably be remains of the trochanters. The outstanding characteristic of these joints, whether femora or not, is their extraordinary breadth—more than a third of that of the carapace. In the specimen itself they give the impression of being essentially a normal joint (like the femur of *Anthracosiro*, fig. 5) *plus* a flattened forward expansion. The hinder border, corresponding to the normal joint, is much thicker than the expanded part, and forms a raised ridge at the back of it. It is itself marked by longitudinal ridges, and these in the second leg are distinctly granulated. The femur of the first leg shows what is apparently its proximal end; it is narrowed towards that end and appears to be somewhat squared off at the articulation. The corresponding part of the second femur is very imperfectly preserved, but traces of a similar structure can be made out in certain lights. The removal of the matrix at the front of the second femur has revealed something suggestive of one or two succeeding joints folded forward beneath the femur (compare fig. 5); but this is much too indistinct to admit of any definite statement. The femora of the remaining legs are tilted forwards and downwards at so steep an angle that it is hardly possible to follow them down into the matrix. The little that is seen of them, however, suggests that they were much like those that are exposed; on nearly all of them can be seen traces of the ridges about the hind border. Their forwardly tilted position is possibly that of life; it is difficult at any rate to see how the legs could have been used if these broad, flat femora had all been held horizontally. On the left side, and apparently

also on the right, the angle of tilt gets steeper with each leg from the first to the last. The femur of the first leg is not far from the horizontal, that of the last appears to be vertical, and the intermediate femora lie at intermediate angles. This progressive tilting of the femora must be borne in mind in looking at fig. 8, an attempt to restore the proximal joints of the legs from what is seen of them in the fossil. The shape of the trochanters is more or less based upon the rather well defined structure lying in front of the cephalothorax on the right, which is very probably the trochanter of the first leg on that side.

As to the general systematic position of the arachnid represented by this fossil no prolonged discussion is necessary. Whatever the Anthracomarti (Meridogastra) may be, there is no question but that this is one of them. To place it in any of the established genera of the group is more difficult. A number of characters, however, indicate that it is very near to *Anthracosiro*, if not actually a member of the genus. Indeed, allowing for the differences to be expected between a dorsal and a ventral exposure, it even agrees very fairly with *A. woodwardi* Pocock*, the type species of the genus (fig. 5). The length of the body is practically the same. The general shape is a little different, the Crawcrook specimen being rather broader behind : but this may readily be due to different conditions of fossilization. The segmentation of the abdomen agrees very closely in the two forms; in number, size, and shape the plates are nearly identical, the only conspicuous difference being that in the present specimen there is no suture between the median plates and their lateral laminæ; and this is a difference that is normal in the ventral plates of Anthracomarti as compared with the dorsal. The anal plates, the unusual position of which is a striking feature in the Crawcrook fossil, cannot be compared directly with the same parts in *Anthracosiro*. But in Pocock's specimens of *A. woodwardi* the impression of the underlying circular anal plate, though

* R. I. Pocock. A New Carboniferous Arachnid. Geol. Mag., 1903, p. 247.

not indicated in his figure, was "plainly visible through the eighth segment near its anterior border." This accords well with its position in the Crawcrook example; it is precisely the nearness of the circular plate to the anterior border of the eighth segment that constitutes the chief peculiarity of this region. In Pocock's figure of his species, projecting spiniform angles are shown at the back of the outer border in segments 6 and 7, but he states that the existence of these spines is by no means certain, and none were found in his second species, *A. fritschii**. There is no sign of any such spines in the Crawcrook fossil.

The comparison breaks down, however, in regard to the limbs. Pocock's figure shows limbs of a normal type in his *Anthracosiro woodwardi*. If, therefore, the Crawcrook fossil is of the same species, one of three propositions must be true: (1) the forward expansions of the femora must be a character not possessed by all individuals of the species, *e.g.* something of the nature of a sex character, which is highly improbable; (2) the expansions must have been broken off in Pocock's example or so indistinctly preserved as to have been overlooked; or (3) I must have been deceived as to the presence of these expansions in my own specimen. The third supposition is so much the most likely on the face of it that I have tried repeatedly to convince myself of its truth; but I have been driven to the conclusion that the broad flanges of the first and second femora have as definite an existence as any other part of the fossil. In view of this striking point of disagreement it seems impossible at present to regard the Crawcrook arachnid as an example of *Anthracosiro woodwardi*; nor is there enough evidence to declare it definitely an *Anthracosiro* at all. On the other hand there are good grounds for thinking it may belong to that genus, and no sufficient reason for putting it in any other. I suggest, therefore, that until further light can be thrown upon its identity it should be known as *Anthracosiro latipes*.

* Geol. Mag., 1903, p. 406.

1.

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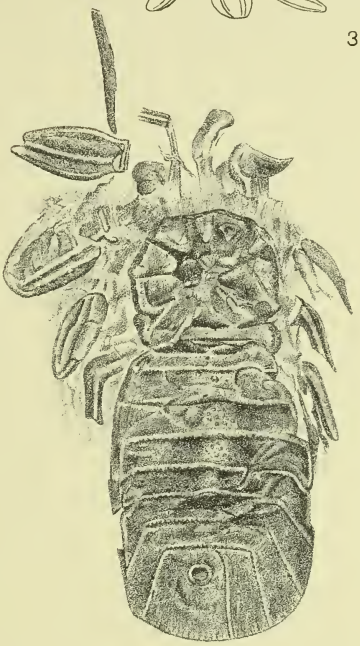

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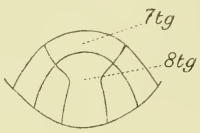

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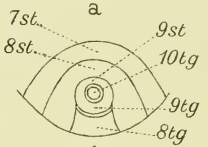

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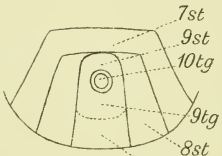

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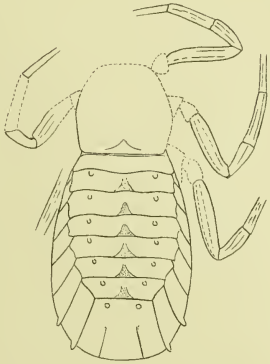

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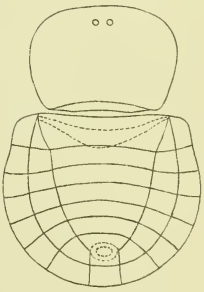

6.

E. L. Gill del.

E. Wilson, Cambridge.

A COAL MEASURE ARACHNID.

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EXPLANATION OF PLATE XIII

Fig. 1. Anthracosiro latipes, sp. n. Coal Measures, Crawcrook, near Ryton-on-Tyne. Outline, natural size.

,, 2. The same. Three times natural size.

,, 3. The same. Outline, side view. Twice natural size.

,, 4. The same. Restored outline of body, ventral aspect. Twice natural size.

,, 5. Anthracosiro woodwardi, Pocock. Dorsal aspect. $1\frac{3}{4}$ times natural size. Reduced and slightly simplified from Pocock's figure.

,, 6. Anthracomartus palatinus, Ammon. Outline, dorsal aspect; the details in dotted lines belong to the ventral side. Twice natural size. Copied from Ammon, with modifications.

,, 7. Anthracosiro latipes. Detail from cephalothorax.

,, 8. The same. Suggested restoration of proximal joints of legs.

,, 9. The same. Diagram of posterior abdominal segments; *st* sternite, *tg* tergite.

,, 10. Anthracomartus voelkelianus, Karsch. Diagram of posterior abdominal segments; *a* dorsal, *b* ventral aspect. Copied from Haase, with lettering after Pocock.

On some New and Little-known Exotic Thysanoptera

By Richard S. Bagnall, F.E.S., F.L.S.

In the present contribution we have pleasure in describing nine new and interesting species, one of which is the type of a new genus, and in giving further records of five recently described forms. With the exception of *Leptothrips flavicornis* sp. n., from Madeira, *Compsothrips albosignatus* (Reut.) from France, and *Docessissophothrips monstrosus* sp. n., from New Caledonia, all the species are from the Malay Archipelago.

The chief material has been taken from a small collection of carded specimens kindly submitted by the Director of the Leyden Museum, Holland, and from a collection made in the Isle of Nias, and very generously presented to the writer by Dr. Karl Jordan. This latter collection, so far as the Malayan material alone is concerned, consists of six tubes containing thousands of specimens, the largest proportion of which are referable to the one species, *Zygothrips jordani* sp. n., though two other forms, *Dinothrips sumatrensis* Bagnall and *Ecacanthothrips sanguineus* (Bagnall), are moderately well represented. In addition we are able to describe *Dicaiothrips malayensis*, *D. denticollis*, and *Plectrothrips collaris* from this collection, and no doubt when the almost countless number of specimens have been examined critically more forms will be discovered.

Three species from the Leyden Museum, *Panurothrips gracilis* Bagnall, *Phlœothrips similis* sp. n., and *P. longitubus* sp. n., are especially interesting, inasmuch as they bear a strong superficial resemblance to one another, and in addition are found on the same plant, the Waringin tree.

Genus PANUROTHRIPS Bagnall, 1908

Panurothrips gracilis Bagnall. (Pl. xiv., figs. 1–3).

Examination of more recent and better (though by no means perfectly) preserved specimens suggest a few slight amendments of the original description.

The hind and intermediate tibiæ are shaded with brown below the knees.

The antennal sense-cones are short and inconspicuous; there appear to be two on each of the joints four to six, but only a single cone on the third joint on the outer side. The head is only a little more than two and one-half times the length of prothorax, and more than one-half the length of the tube, which, in the type specimen, is extended from the ninth segment and set laterally, thus appearing longer and more slender than it actually is when viewed dorsally. There are no prominent bristles on the fore-coxæ, the pair at the posterior prothoracic angles having been mistaken for such. Thus the prothorax has the bristles at the posterior angles moderately long, and in addition there is a smaller bristle at each mid-lateral angle.

The species was originally described from Siam, and we are now able to record it from Semerang, Java, specimens of both sexes having been taken by Mr. Edv. Jacobson from the young top leaves of the Waringin tree. Two other species (*Phlœothrips longitubus* sp. n. and *P. similis* sp. n.) were taken by Mr. Jacobson from the same tree, both closely resembling *P. gracilis* as regards the type of coloration.

We are glad to add that we have recently had the pleasure of describing a second species of *Panurothrips* (*P. caudatus* Bagnall) from South Africa.

Genus DICAIOTHRIPS Buffa, 1909

Dicaiothrips malayensis sp. n. (Pl. xiv., fig. 4).

♂. Length 4·85 to 5·5 mm.; breadth of mesothorax 0·57 to 0·6 mm. General colour dark chestnut brown, tip-end of each tibia lighter, and all tarsi yellowish brown. Antennæ one and two-thirds as long as head; joints three to five yellow, the third lightly shaded with brown at tip, the fourth with apical third brown, and the fifth yellow only at the base of stem. Head three times as long as the prothorax, and two and three-quarters as long as wide near base; vertex produced beyond

eyes for about one-seventh the total length. Eyes somewhat small and bulging, post-ocular spines apparently absent; ocelli placed as in *D. foveicollis* Bagnall. Antennæ with the third and fourth joint subequal, and the three apical joints fusiform, long, and slender.

Fore-legs slender, almost as in *D. foveicollis*, tarsus armed with a sharp and slender spur.

Seventh and eighth abdominal segments each one-fifth longer than broad, the seventh being a little longer than the eighth. Tube rather stout, longer than either the seventh or eighth segment, three times as broad at base as at tip, a little more than three times as long as broad at base, and only two-thirds the length of the head.

Type.—In coll. Bagnall.

Habitat.—Several males from the Isle of Nias (Karl Jordan).

D. malayensis may at once be separated from *D. foveicollis* (Bagnall), *D. grandis* Bagnall, *D. laevicollis* Bagnall, and *D. propinquus* Bagnall, by the fact that the third antennal joint is not longer than the fourth. It also differs considerably from *grandis* and *propinquus* in the relative lengths of the abdominal segments, in these respects coming nearest to *foveicollis* and *laevicollis*, but possessing a decidedly stouter tube than either of these latter insects. From *D. championi* Bagnall (in which the antennæ are not described) it may be known by its smaller size, the apparent absence of post-ocular bristles, the more slender legs and less elongated abdominal segments; from *D. distinctus* Bagnall (antennæ unknown) by the decidedly more strongly produced forehead and the relative lengths of the seventh and eighth abdominal segment; from *D. nitidus* Bagnall (in which species, also, the form of antennæ is unknown) by the less strongly produced forehead, and from *D. brevicornis* Bagnall (of which we only know the ♀) by the longer antennæ with the third and fourth joints subequal, and by the more strongly produced head.*

* These species are all Neotropical, and are described in a paper which I have presented to the Linnean Society, but which is not yet published.

Dicaiothrips denticollis sp. n. (Pl. xiv., fig. 5).

♀. Length 6·25 mm.; breadth of mesothorax 0·75 mm.

Very like the preceding, differing chiefly in the larger size and the coloration of the antennæ, which have the third joint only of a clear yellow colour, shaded at apex with brown, the rest of the antennæ being concolorous with the head. The third antennal joint is also slightly longer than the fourth.

In the prothorax we notice a distinct tooth-like projection at each mid-lateral angle which we have not observed before in any species of *Dicaiothrips* or *Idolothrips*. The prothoracic bristles are all apparently present, the mid-lateral pair and those at the anterior angles being somewhat remote from the lateral margin. The tube is nine-tenths the length of the head.

The general colour is light brown (perhaps the example is somewhat immature), and the body shows considerable and widely distributed crimson hypodermal pigmentation.

Type.—In coll. Bagnall.

Habitat.—One ♀ from the Isle of Nias (K. Jordan).

The single specimen is a female, and we are therefore unable to compare it with the other members of the genus, though its close relationship with *D. malayensis*, described above, will help us to recognize the species. The coloration of the antennæ is at once distinctive, and is the same as described by Buffa in the male specimens from the Isle of Engano, and referred by him to the *Idolothrips schœtti* (Heeger) Uzel, sinking the writer's *I. foveicollis* as a synonym. Although Buffa gives the size of his examples as 8·2 mm., it is possible that they are referable to the species now described; in any case neither *D. denticollis* nor Buffa's *D. schœtti* can be referred to *D. foveicollis*, nor can either, we think, be the same as the species *schœtti*, described by Heeger from Brazil.

Genus LEPTOTHRIPS Hood (*in litt.*), 1909

In 1902, Dr. Hinds, in his well-known paper on the North American *Thysanoptera**, described a species under the name of *Cryptothrips aspersus*, which is obviously not referable to the genus *Cryptothrips* Uzel, *s.s.* More recently Hood erected the genus *Phyllothrips*† for the reception of *P. citricornis* Hood and *C. aspersus* Hinds. Mr. Hood agrees with the writer, however, in regarding his *P. citricornis* as a species of *Liothrips* Uzel, and, being the type species of the genus *Phyllothrips*, that name must be sunk as a synonym of *Liothrips*. It is evident, too, that *C. aspersus* cannot be admitted in either of the genera *Cryptothrips* or *Liothrips*. Hood therefore proposes (*in litt.*, April 13, 1909) to erect the genus *Leptothrips* for the reception of Hinds' *C. aspersus*.

We are pleased to be able to describe a second species of that genus.

Leptothrips flavicornis sp. n. (Pl. xiv., figs. 6-8).

♂. Length 2·6 mm.; breadth of mesothorax 0·4 mm.

General colour chestnut-brown. Antennæ transparent yellow, excepting the two basal joints; apical joints slightly tinged with a darker shade. All tarsi yellow; fore-tibiæ shaded from a light brown at knee to light yellow at tips, and the intermediate and hind tibiæ clear yellow at tips also.

Head nearly twice as long as the prothorax, and one and one-half times as long as broad. Vertex raised, bearing the anterior ocellus at extreme apex. Mouth-cone rounded, and reaching about two-thirds across prosternum; cheeks subparallel. Eyes finely facetted, occupying about one-third the length of the head; ocelli large, the posterior pair close to margins of eyes, and on a line drawn through their anterior third. Antennæ inserted below vertex, a little more than one and three-quarter times the length of head; joints three to six clavate, practically subequal in length, the sixth being

* Proc. U.S. Nat. Museum, xxv., pp. 79-242, pl. i.-xi., 1902.

† The Canadian Entomologist, xl., pp. 305-309, 1908.

slightly shorter than either of the three preceding joints; seventh linear, four-fifths the length of sixth, and the apical pointed at tip and three-fifths the length of the penultimate.

Prothorax transverse, one-half as long as broad (excluding fore-coxæ); spine at each posterior angle exceptionally long, being more than two-thirds the length of prothorax; a minute seta at each anterior angle; others apparently obsolete. Pterothorax about as broad as long; sides of metathorax slightly arcuate and narrowed to base of abdomen; legs moderately slender, fore-femora only slightly thickened, and the fore-tarsi unarmed. Wings reaching to the seventh abdominal segment, median vein apparently obsolete.

Abdomen long and slender, segments one to seven strongly transverse, and each narrower than the preceding, and parallel laterally; tapering gradually from the middle of the eighth segment to tube. Tube one and one-sixth times the length of head, slender, and longer than the two preceding segments together, narrowed slightly from the apical third to tip. Terminal hairs and those on the ninth segment slender, about three-quarters the length of tube. Abdominal spines slender, pale and not very conspicuous.

♀. Abdomen in the female a little broader than in the male, practically paralled-sided from the first to the seventh segment, and from thence gradually narrowed to tube.

Type.—In the Copenhagen Museum.

Habitat.—Both sexes collected by Dr. Meinert in Madeira.

L. flavicornis may readily be separated from *Leptothrips (Cryptothrips) aspersus* Hinds by its larger size, the exceptionally long bristles at posterior prothoracic angles, as well as by the very long tube.

Genus COMPSOTHRIPS Reuter, 1904

Compsothrips albosignatus (Reuter).

Leyden Museum.—Five specimens collected by Mr. F. Ancey, Marseilles. Apparently the first record of this insect's occurrence in France.

Genus ZYGOTHRIPS Uzel, 1895

Zygothrips jordani sp. n. (Pl. xiv., figs. 9–10).

♀. Length 1·9–2·1 mm.; breadth of mesothorax 0·32–0·34 mm.

Colour uniform dark brown; antennal joints three to six clear yellow, two apical joints greyish-brown; tibiæ light brown, shaded to yellow at tip; fore-tarsi yellow.

Head about one and one-third as long as broad behind eyes, and one and one-third as long as prothorax; vertex slightly raised. Eyes large, moderately finely facetted, occupying about two-fifths the length of head, pigment deep black; post-ocular spines close to the posterior margins of eyes. Ocelli large, anterior ocellus overhanging, posterior pair placed above a line drawn through centre of eyes. Mouth-cone broadly pointed, reaching half-way across the prosternum. Antennæ inserted below vertex, about one and three-quarters the length of head; joints three to five claviform, sixth truncate distally, and seventh and eighth moniliform; a pair of long acute sense-cones on each of the segments three to six.

Prothorax one and one-third times as broad as long, all spines present, moderately short, those as posterior margins being the longest. Pterothorax about one and one-quarter times as long as broad, wings present, apparently narrowed in middle, and reaching to base of the fifth abdominal segment. Legs moderately stout, fore-femur incrassate, tibia short and stout, and tarsus furnished with a small tooth.

Abdomen as broad as pterothorax, gradually and roundly narrowed to tube. Two pairs of wing-retaining spines on each of the segments one to seven; pair near anterior margins of segments one to six very strongly developed, and each protected by a strong, inwardly-directed sub-lateral spine on the outer side and close to its base. Tube short and stout, one-half the length of head, five-eighths as broad at base as long, and about twice as wide at base as at tip. A pair of short strong spines at apex of ninth segment.

♂. The male has the fore-femur strongly incrassate, and the tibia and tarsal tooth stout.

TYPE.—In coll. Bagnall.

HABITAT.—This species is very numerously represented in the collection from the Isle of Nias (K. Jordan), and we find pleasure in naming it in Dr. Jordan's honour.

We may add that we are not yet perfectly familiar with the limitations of certain European genera, and it is therefore with some hesitation that we refer this form to the genus *Zygothrips* Uzel. It should also be noted that the specimen figured in the plate is a very small one.

GENUS PLECTROTHRIPS Hood, 1908

Plectrothrips collaris sp. n. (Pl. xiv., figs. 11–14).

♂. Length 1·85 mm.; breadth of mesothorax 0·4 mm.

Colour uniform reddish brown, tibiæ lighter, and all tarsi yellowish brown. Antennæ with the third joint also lighter.

Head about seven-eighths as wide at base as long, and about four-fifths as long as prothorax; truncate in front, widest behind eyes, from whence it is narrowed slightly to base; post-ocular bristles as in *P. antennatus* Hood*, namely, near the lateral margins and midway between the posterior margin of eyes and the anterior margin of prothorax. Eyes large, occupying more than one-third the length of head; facets moderately fine; anterior ocellus presumably at the extreme vertex of head and overhanging; posterior pair widely separated, large and placed on a line drawn through the anterior third of eyes and contiguous with them. Antennæ inserted beneath the vertex, twice as long as broad; the joints two to eight almost subequal; two to six roughly obconical, seventh oblong and constricted near base, and the eighth fusiform or narrowly pyriform. A pair of moderately long and stout sense-cones on joints three, four, and five, and a single cone on the inner side of the sixth antennal joint.

* Bulletin of the Illinois State Laboratory of Natural History, viii., Art II., p. 370, August, 1908.

Mouth-cone small, scarcely reaching one-third of the way across the prothorax.

Prothorax long and heavy, one and one-quarter the length of head, and less than two-thirds as long as the width across fore-coxæ. Similar to the prothorax of *P. antennatus*, with notum not attaining the lateral margins, a prominent median line, and all spines absent excepting only the pair at posterior angles, which in *P. collaris* is apparently represented by the seta-pits only, though the bristles may be present but difficult to discern, owing to the deep pigmentation of the chitin. Pterothorax very slightly broader than long, and only a little wider than the prothorax at base; not strongly arcuate at sides as in *P. antennatus*, but slightly narrowed towards the base of abdomen from the anterior margins of the metathorax. Wings reaching to base of tube, slightly narrowed at tip, and each with a faint median vein running from base to extreme apex; colour faintly sulphureous; cilia long. Fore-legs strongly incrassate, tibial spur difficult to make out owing to the legs in the type specimen being set beneath the head; fore-tarsal tooth large, and as broad at base as long. Intermediate tibia with a long stout spur, and the hind tibia with two (or perhaps three, a long central one and a shorter one on each side) longer and stouter spurs at the tip within.

Abdomen slightly narrower than pterothorax, sides parallel to the sixth segment, and from thence roundly narrowed to base of tube. Tube about seven-eighths the length of the head, narrowed somewhat sharply at tip. Terminal bristles and those on the ninth abdominal segment longer than the tube.

Type.—In coll. Bagnall.

Habitat.—A single ♂ collected by Dr. Jordan from the Isle of Nias.

P. collaris may be easily separated from *P. antennatus* Hood by its larger size and darker coloration; the apical antennal joint, which is not distinctly longer than the penultimate; the shorter head and larger eyes; the longer tube; and

by the presence of a median vein in the wings, and the fact that the sides of the pterothorax are not strongly arcuate as in *P. antennatus*.

Genus PHLŒOTHRIPS Haliday

We now recognize three somewhat closely allied Malayan species of *Phlœothrips* which may be tabulated as follows :—

1. Tube two-thirds the length of head ; all tibiæ yellow ; lateral cephalic spines set in warts. **spinipes** Bagnall.
2. Tube almost as long as, or longer than head ; hind and intermediate tibiæ concolorous with femora ; lateral cephalic spines not set in warts :—
   - i. Tube seven-eighths the length of head ; prothorax strongly convex, and all spines present ; hind and intermediate tibiæ totally concolorous with femora. **similis** sp. n.
   - ii. Tube one and two-thirds the length of head ; prothorax not convex, spines at posterior angles and posterior marginal pair exceptionally long, others obsolete ; hind and intermediate tibiæ yellow at tips. **longitubus** sp. n.

Phlœothrips similis sp. n. (Pl. xiv., figs. 15–19).

♀. Length 3·0 mm. ; breadth of mesothorax 0·5 mm.

General colour uniform brown ; antennæ, excepting basal joints, which are concolorous with head, yellow with a darker tinge at apex ; fore-tibiæ yellowish and all tarsi yellow.

Head one and one-third times as long as broad, or as long as the prothorax, slightly constricted near base ; lateral spines minute, not set in warts. Vertex slightly raised, bearing anterior ocellus at the apex ; surface finely striate transversely. Eyes finely facetted, large, occupying one-third the length of head. Ocelli large, anterior ocellus overhanging, posterior pair touching margins of eyes, and on a line through their anterior third. Pigmentation of eyes and ocelli deep black. Antennæ inserted below vertex, about one and three-quarters the length of head ; joints three to five claviform, three and four being broader than any of the others ; sixth mildly claviform, and the two apical joints moniliform or weakly fusiform.

Sense-cones rather long, a pair on each of the joints three to six. Mouth-cone rounded at tip, scarcely reaching halfway across prosternum.

Prothorax strongly convex, about five-eighths as long as broad, all spines present, and, excepting the anterior marginal pair, moderately prominent, the pair at posterior angles being the longest. Pterothorax nearly as long as broad, sides of metathorax gently narrowing to base of abdomen. Wings present, reaching to base of the sixth abdominal segment. Legs stout; intermediate and hind femora slightly thickened, and each set with a series of minute spines along the outer margin; fore-coxa with a prominent spine: fore-femur incrassate; tibia short and stout; and tarsus armed with a sharp tooth.

Abdomen gradually tapering from base to tube. Tube about twice as broad at base as at tip, three times as long as broad at base, and nearly as long as the head; narrowed from the anterior third to apex. Terminal hairs about five-eighths the length of tube, and those on ninth segment as long as tube; other abdominal bristles comparatively long and slender.

♂. The fore-femur in the male is very strongly incrassate, the tibia is very short and stout, whilst the tarsal tooth is also much stronger than in the female.

Type.—In the Leyden Museum.

Habitat.—Both sexes from the young top-leaves of the Waringin tree, Semarang, Java (E. Jacobson).

Phlœothrips longitubus sp. n. (Pl. xiv., figs. 20–21).

♀. Length 2·95 mm.; breadth of mesothorax 0·49 mm.

General colour brown; antennæ, excepting basal and part of second joint, all tarsi, fore-tibiæ and tips of intermediate and hind tibiæ clear yellow.

This species is very like *P. similis*, but apart from the colour distinctions it differs in many points.

The head is widened posteriorly; the post-ocular bristles are shorter and placed further behind the eyes; the antenna has the second joint shaded with yellow, is not tinged at apex, is more elongate and slender, and is nearly twice the length of the head. The mouth-cone reaches more than half-way across prosternum.

The prothorax is less than two-thirds the length of the head, nearly twice as broad as long, and appears to have but two prominent pairs of bristles, namely a very long one at each posterior angle, being three-quarters the length of the prothorax, and the posterior-marginal pair. The hind and intermediate legs are not so stout, whilst the fore-legs have the femora only slightly swollen and the fore-tarsal tooth minute.

The tube is exceptionally long, being almost four times as long as broad at base, and one and two-third times as long as the head. The terminal hairs are five-eighths, whilst those on the ninth abdominal segment are seven-eighths the length of the tube.

Type.—In the Leyden Museum.

Habitat.—On the young top-leaves of the Waringin tree, Semarang, Java (E. Jacobson). The specimens occurred in company with *Panurothrips gracilis*, to which species it bears a strong superficial resemblance.

Genus ECACANTHOTHRIPS Bagnall, 1908

Acanthothrips Bagnall (nec Uzel), Ann. and Mag. of Natural History, Ser. 8, i., p. 361, April 1st, 1908.

Ecacanthothrips Bagnall, Annales de la Soc. Ent. de Belgique, lii., p. 349, Dec. 31st, 1908.

Ormothrips Buffa, "Redia," v., fasc. 2, p. 166, March 1st, 1909.

Ecacanthothrips sanguineus (Bagnall). (Pl. xiv., fig. 22).

Ormothrips sanguineus Buffa, "Redia," v., fasc. 2, p. 167, pl. viii., figs. 10–13.

Buffa records both sexes of this species from Sumatra, Is.

Mentawei, and Is. Engano. It was described from a single dried and carded female taken by Dr. A. R. Wallace in New Guinea. An examination of well-preserved specimens shows a peculiar series of blunt sense-organs arranged round the apex of the third antennal joint (pl. xiv., fig. 22) which are described by Buffa. The genus is a strongly characterized one, and contains two Malayan species, *sanguineus* (Bagnall) and *inermis* (Buffa).

There are numerous specimens of *sanguineus*, including both sexes, in the collection from the Isle of Nias.

Genus MACROTHRIPS Bagnall, 1908

Macrothrips papuensis Bagnall.

Leyden Museum.—Two males from Sekroe, New Guinea, May, 1897 (Schadler).

Buffa records the species from Ramoi, 1 ♂, and from Ternate, 3 ♀s (O. Beccari, 1875) describing the female sex, which was previously unknown.

Genus DINOTHRIPS Bagnall, 1908

Dinothrips sumatrensis Bagnall.

This is apparently a common and widely distributed Malayan insect, and is recorded by Buffa from several localities. In the Jordan collection from the Isle of Nias both sexes are very numerously represented.

Leyden Museum.—G. Salak, Buitenzorg, Sumatra, 2 males in November (E. Jacobson); Sekroe, New Guinea, 1 female, August, 1898 (Schadler); and Java, 1 female (J. B. Pasteur).

Paris Museum.—Benghalis, Sumatra, 3 males, 1885 (Maindron); Tuyen-Quan, Central Tonkin, 2 males and 3 females, 1901 (A. Weiss); Sebroang, 1 male, November, 1890.

Genus ADIAPHOROTHRIPS nov.*

We propose this genus for the reception of a species which falls naturally into a group of Malayan genera, *Macrothrips*

* Greek *adiaphoros*, "with no *differentia*."

Bagnall, *Dinothrips* Bagnall, and *Machatothrips* Bagnall, but differs in certain negative characters from members of either of these genera.

From *Macrothrips* the male differs by its simple, non-foveolate prothorax, and the simple fore-coxæ, fore-femora, and fore-tibiæ; from *Dinothrips* by the absence of the bifurcate mesothoracic projections, and from *Machatothrips* by the simple fore-femora.

The species named below is smaller than any described member of the group referred to above.

Type.—*Adiaphorothrips simplex* mihi.

Adiaphorothrips simplex sp. n. (Pl. xiv., figs. 23-24).

♂. Length 5·0 mm.; breadth of mesothorax 0·875 mm.

Colour very dark brown, almost black; tips of third and fourth antennal segments lighter, and fore-tibiæ and tarsi reddish brown.

Head about one and three-quarters as long as wide behind eyes, depressed, narrowed a little behind eyes, roundly broadened at basal third, and slightly constricted at base; apex narrowly emarginate between basal joints of antennæ, and cheeks set with several strong spines. Eyes finely facetted, occupying about one-quarter the total length of head; post-ocular spines long. Ocelli equidistant, moderately large; posterior pair on a line drawn through centre of eyes, and not touching their margins. Antennæ inserted at apex of head and below vertex; joints six to eight absent in type, but the antenna altogether evidently at least twice as long as head; intermediate joints much elongated, fourth and fifth joints each three-quarters as long as the third and fourth respectively.

Prothorax about two-thirds the length of head, and nearly one-half as long as broad; surface convex, smooth, and shining; all spines excepting the anterior-marginal apparently present, short. Fore-femur strongly inflated, tibia stout, and tarsus armed with a long, strong tooth. Pterothorax transverse, broader than prothorax, and three-quarters as long as

broad; dorsal surface strongly reticulate. Wings present, reaching to sixth abdominal segment; edges and basal third tinged with greyish brown, cilia dark; median vein running almost to the basal third, dark brown and shaded to greyish-brown towards its end. Hind and intermediate legs moderately long and stout.

Antennæ somewhat broad, though not as broad as pterothorax, widening to third segment, and from thence narrowing to tube. Tube more than three times as long as broad at base, and one and one-fifth as long as the head; sparsely and minutely setose; sides narrowing evenly to tip, where it is about two-fifths as broad as at base. Terminal bristles slender, about three-quarters the length of tube, and those at apex of ninth segment stronger and as long as the tube. Other abdominal bristles strong and pale-coloured, excepting a short pair of dark ones on each of the segments seven and eight. Bristles on segments four to seven very long, including one pair on each segment longer than the others.

Type.—In the Leyden Museum.

Habitat.—Two males collected by Mr. Th. F. Lucassen at Sambas, Borneo, in May, 1890.

Genus DOCESSISSOPHOTHRIPS Bagnall, 1908

Docessissophothrips monstrosus sp. n. (Pl. xiv., fig. 25).

Length, 5·0 mm. or more.

The specimen is dried and badly mounted; the head is shown laterally, and is severed from the prothorax, which latter is up-ended. The abdomen is curled inwards, the tube is absent, the antennæ are mutilated, whilst the legs and other members are either mutilated or in such a position as to be difficult to describe.

The head is strongly compressed laterally, and occupies more than one quarter the total length of the body. The dorsal margin is strongly arcuate, the eyes are on the same level as the juncture of head with prothorax; the vertex is

sharply angled, broadly rounded below the eyes, and the head ventrally emarginate as shown (pl. xiv., fig. 25). The eyes, set laterally, are very small and finely facetted, occupying about one-eighth the length of the head; the ocelli are situated on a hump near to the insertion of the antennæ, directly above the eyes, and are protected by the long, slender, white bristles. Post-ocular bristles obsolete. The antennæ are black with the exception of the stem of the third and the apex of the second joint, these possessing a reddish brown tinge. Joints two to six claviform; fourth less than seven-eighths of third; third seven-eighths of fourth; sixth mutilated, and the apical joints unfortunately absent. Apparently a pair of sense-cones on each of the joints three to five, and probably on the sixth. Viewed dorsally the head is much narrower than in *D. ampliceps* Bagnall, the dorsal surface looking like a strongly chitinized carina; the cheeks are slightly swollen and set with a few white setæ. The colour of head is a very dark brown, almost black; there is a pale lateral patch behind eyes, and a similar, though longer and narrower patch, reaching from base for one-half the length of head on each side of the dorsal margin. The dorsal margin is lighter in colour than the cheeks, whilst above the cheeks we notice some light crimson hypodermal pigmentation.

The prothorax is apparently very short, and set with long bristles as in *D. ampliceps*. Pterothorax mutilated; wings present, reaching to the ninth dorsal segment, coriaceous, with yellowish tinge; cilia greyish brown. Legs moderately long; fore-femur slightly thickened; fore-tarsal tooth minute; intermediate and hind legs long.

Abdomen broader than the pterothorax; spines pale, long and slender; general colour very dark brown, lateral margins with series of crimson patches. All tarsi yellow; tibiæ also yellow, and shaded with brown below knees.

Type.—In the Leyden Museum.

Habitat.—A single specimen from Mount Kogui, New Caledonia (A. Fauvel).

EXPLANATION OF PLATE XIV.

Fig. 1. Panurothrips gracilis Bagnall, ♀. Head, prothorax, and right antenna and fore-leg × 27.

,, 2. ,, ,, ,, ♀. End of abdomen × 27.

,, 3. ,, ,, ,, ♂. ,, × 27.

,, 4. Dicaiothrips malayensis sp. n. ♂. Joints 3–8 of right antenna × 40.

,. 5. ,, denticollis sp. n. ♀. ,, ,, × 40.

,, 6. Leptothrips flavicornis sp. n. ♂. Head, prothorax, and right antenna and fore-leg × 27.

,, 7. ,, ,, ,, ♂. End of abdomen × 27.

,, 8. ,, ,, ,, ♂. Ventral view of ninth abdominal segment, *s* sternite, *t* tergite × 60.

,, 9. Zygothrips jordani sp. n. ♀. Head, prothorax, left antenna, and fore-leg × 38.

,, 10. ,, ,, ,. ♀. End of abdomen × 38.

,, 11. Plectrothrips collaris sp. n. ♂. Head, prothorax, fore-legs, and right antenna × 38.

,, 12. ,, ,, ,, ♂. End of abdomen × 38.

,, 13. ,, ,, ,, ♂. Apex of right posterior tibia and tarsus, showing tibial spurs, × 90.

,, 14. ,, ,, ,, ♂. Apex of right intermediate tibia and tarsus, showing tibial spur, × 110.

,, 15. Phlœothrips similis sp. n. ♀. End of abdomen × 27.

,, 16. ,, ,, ,, ♀. Joints 3–8 of right antenna × 40.

,, 17. ,, ,, ,, ♂. Base of right fore-femur, showing organ of doubtful function, × 75, *f* femur, *t* trochanter, *c* coxa, *x* organ.

,, 18. ,, ,, ,. ♂. Maxillary palpus × 135.

,. 19. ,, ,, ,, ♂. Labial palpus × 135.

,, 20. ,, longitubus sp. n ♀. End of abdomen × 38.

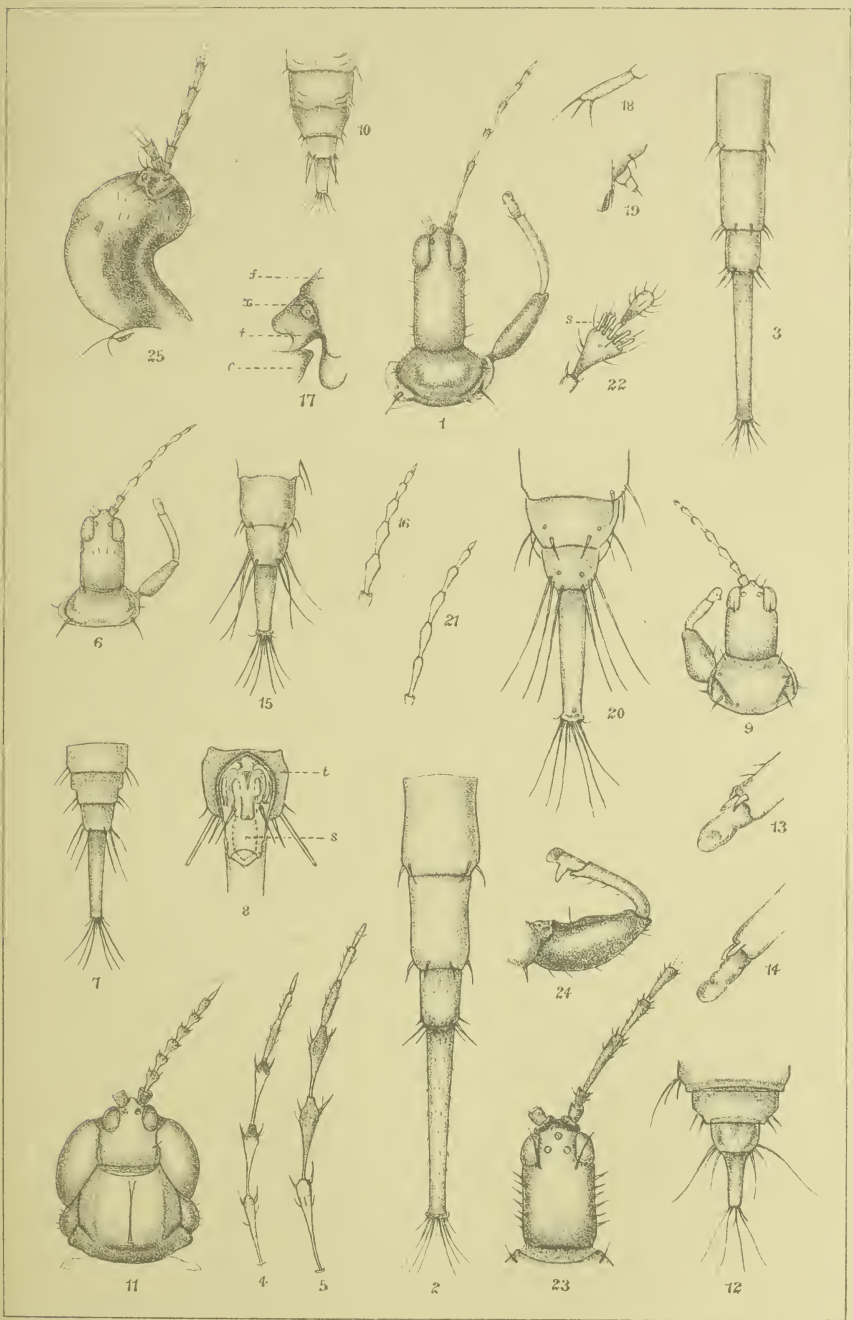
,, 21. ,, ,, ., ♀. Joints 3–8 of right antenna × 40.

,, 22. Ecacanthothrips sanguineus (Bagnall). Third antennal joint, *s* sense-organs × 57.

,, 23. Adiaphorothrips simplex sp. n. ♂. Head and part of right antenna × 27.

,, 24. ,, ,, ,, ♂. Right fore-leg × 19.

,, 25. Docessissophothrips monstrosus sp. n. Lateral view of part of head and part of antennæ × 27.



R. S. Bagnall, del.

W West lith.

NEW THYSANOPTERA.

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NATURAL HISTORY SOCIETY

OF

NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE

REPORT OF THE COUNCIL

FOR 1908–1909

The work of the Natural History Society has now for some years proceeded upon more or less uniform lines, these having proved to be the most practicable upon which the Society, with its present means, can further the aims for which it exists. In presenting their report for the year, your Council have therefore to refer in the first place to certain usual features of the Society's work: the upkeep and development of the museum, the organization of meetings, lectures, and outdoor excursions, and the publication of scientific papers.

A short account of the year's work in the museum is appended as usual to this report, and renders unnecessary any detailed reference to it here. But the Council would like to call the attention of members to the steady improvement that is taking place year by year, and in particular, at the present time, to the gradual transformation of the zoology room. The most striking of the recent changes has been that undergone by the collection of fishes; instead of being as before one of the poorest sections of the museum, this is now one of the most attractive. Your Council feel that the Society is much indebted to the staff at the museum, and particularly to their curator, for the wholehearted way in which the duties of the institution are discharged in face of having to work under disheartening conditions. The donations made to the museum during the year are referred to in detail in other sections of the report; it will be seen that they include some of great interest and value.

No very noteworthy repairs to the museum building have been required during the year, though it has been necessary to spend the whole of the £40 annually set aside for this purpose. One payment appearing in this year's statement, that of £13 for the painting of the railings, belongs properly to last year's accounts. The other chief items of expenditure under this head are those for the repair of the inner roof-lights of the three main rooms, and for the overhauling of the electric lighting installation. The latter, as it proved, was taken in hand none too soon. The main cable in the basement was in a dangerous condition through exposure to damp: it is now, after being repaired, led to the switchboard by a safer course.

Some attention has also been devoted by the Council to the museum grounds, and one outcome, the removal of four large old trees from the west side of the building, has met with a certain amount of criticism in the local papers. The Council did not, however, decide to have these trees taken down without the fullest consideration of all the circumstances. The trees stood so close to the building and had grown to such a size as seriously to obstruct the lighting of the west corridors; and there was reason to think they were partly responsible for the fact that it was in this quarter of the museum where most trouble had been experienced with damp. The trees, moreover, were so decayed that there was a risk of their being blown down.

Particulars of the lectures and "talks" arranged by the Society and given at the museum during the winter will be found in an appendix. It will be noticed that the subjects are varied and interesting. For the lectures given at the ordinary evening meetings the attendance averaged 72; for the children's lectures 140; and for the "museum talks" 71. The best thanks of the Society are due to the lecturers. The field meetings—instituted by the Tyneside Naturalists' Field Club, and carried on by the Natural History Society since the amalgamation—are still being regularly held, and good work has been done at them. They are reported upon in full each year by the chairman of the Field Meeting section.

A part of the Society's Transactions (Vol. III., New Series, part 1) was issued in the autumn, and the succeeding part is now nearly ready for publication. The largest contribution to this forthcoming issue will be the highly authoritative catalogue of the Crustacea of Northumberland and Durham, which has been prepared by Canon Norman and Dr. G. S. Brady. In regard to the acceptance or refusal of papers offered for the Transactions your Council have several times been placed in a difficult position, and have been obliged, to their great regret, to refuse one or two papers embodying good original work on local natural history. The authors of these particular papers were, however, not members of the Society. Your Council's difficulties in this matter will be understood when it is explained that the balance shown in the Publication Fund is in reality already exhausted; more than half of it has been paid out since the close of the financial year in settlement of a printer's account, and the remainder will scarcely meet the cost of the portion of the current Transactions already in type but not yet charged for.

The publication of scientific work is always a costly matter; it is for this very reason, in fact, that it is regarded as so important a function of societies like our own. It is a necessity for the advanced worker, but he is very rarely in a position to bear the cost of it himself. Hence learned societies as a rule are very largely publishing bodies, making it their chief concern to give to the world the results of the original work done by their members. It was in this way that our own Society's reputation was built up, and this is the main foundation on which its reputation in the scientific world still rests. In spite, then, of the difficulties to which it gives rise, the abundance of good material offered by the members for publication is a gratifying feature in the present position of the Society. And whilst the Society still has the honour of publishing work by distinguished naturalists, like Canon Norman and Dr. Brady, who were associated with the celebrated men of its earlier days, recent volumes of the Transactions give pleasing evidence that its membership includes

some of a younger generation who are actively maintaining the traditions of the past; and the credit of publishing the results of their researches is such as is worth considerable exertion to secure.

For the Hancock Prize Competition of 1908 twelve essays were sent in. The examiners were Dr. G. S. Brady and Prof. A. Meek, with the assistance of Prof. Lebour in the case of the geological essays. On their recommendation the prize was awarded to Mr. Charles Robson, of Birtley, for his excellent essay entitled "A Naturalist's Ramble in Mid-July." Mr. Robson has been known for many years to the staff of the museum as one of the best self-taught field naturalists in the district; with unusually wide general knowledge, he has made a special study of the bees and wasps, and the local series of these insects shown in the museum was a gift from him. The examiners specially commended, in addition, the work of Mr. Parlour of Croft, on the seeds of wayside plants; and of the geological essays, those by Mr. James Caygill (Consett) and Mr. John Wood (Spittal, near Berwick) were mentioned as particularly deserving of praise. A keen competition is hoped for this year, as three additional prizes are offered; the late Mr. George Crawhall, shortly before his death, having provided for the award in 1909 of a second prize of £2, a third prize of £1, and a junior prize also of £1, the latter for candidates under sixteen years of age.

It may be remembered that after a period of decline, the membership last year showed a rise of eleven. This year it has to be reported that the ground thus recovered has unhappily once more been lost. Only twenty-five new members have joined the Society, whilst twenty-three members have resigned, and twelve have been lost by death. The membership at the end of the year stands at 410. It can hardly be doubted that in a district such as that of Newcastle this number might be considerably exceeded if the members would make an earnest effort to induce their friends to join. About seven years ago the membership had sunk to the lowest point it has touched since the present museum was

opened; and yet within a few months from that time over a hundred fresh subscribers had been secured, and the membership has been maintained approximately at the new level ever since. This striking result was brought about by individual effort. It was the outcome of personal applications made to friends and acquaintances; and the history of the Society has shown this to be the only way in which such a result is to be accomplished.

Among the members lost by death are three of the oldest of the vice-presidents—Mr. R. R. Dees, Mr. Norman C. Cookson, and Mr. George E. Crawhall. At the time of his death the late Mr. Dees was by ten years the earliest surviving member of the Natural History Society; he joined it in 1850, and formerly took an active part in its affairs. The late Mr. Norman Cookson will be chiefly remembered in connexion with the Society by the gift of the magnificent collection of minerals left to him by his father, and added to subsequently by himself. This collection now forms the most valuable part of the series exhibited in the mineral galleries of the museum. Mr. Cookson too was among the few surviving members (less than a score) who joined the Society in the 'seventies or earlier.

The generous legacy, spoken of later, which was bequeathed to the Society by the late Mr. George E. Crawhall, was only the last mark of a warm interest which has been shown in numberless ways for many years past. Many of the choicest specimens among the birds and mammals exhibited in the museum were gifts from Mr. Crawhall, and by his will he left to the museum all the objects of natural history he possessed at the time of his death. He was continually on the look-out for birds that were wanted to complete the sets in the Hancock collection, and being one of the best sportsmen and out-of-door naturalists the district has produced, he was able to give most valuable help in this direction. The series of ducks in particular, in which the numerous species in their puzzling phases of plumage are now well represented, is largely made up of specimens procured for the museum by Mr. Crawhall.

Apart, also, from the gifts already referred to, he presented a considerable number of valuable ethnological objects from the South Sea Islands and other parts of the world. He was ready, too, at any time to come forward with liberality when some unusual demand on the restricted funds of the Society necessitated the raising of a special subscription. As a vice-president he attended the meetings of the Council very regularly for many years, and always to the last followed with great interest the different branches of the Society's work, especially all that concerned the museum. By the museum staff, and by all who are closely associated with the institution, he is greatly missed.

A clause in Mr. Crawhall's will recommends the reconsideration of the rule whereby the four members of Council retiring annually are for one year ineligible for re-election.

Certain points concerning the Society's finances call for comment. In regard to the special funds of which separate accounts are printed, it may be explained that the "Bison Fund" was raised to meet the cost of mounting and casing a fine American bison bull presented by Mr. C. J. Leyland of Haggerston Castle; and that another appeal for subscriptions to the Publication Fund was made during the past spring. In contrast with the result of the first appeal, two-and-a-half-years ago, when nearly £250 was subscribed, the response on this occasion barely reached £70; and in view of the importance of the Society's publications as one of its essential activities, and of the difficulty of providing for the cost out of the general fund, this result was disappointing.

Another case has just arisen which necessitates the spending of a sum too large to be provided out of ordinary income. Two unusually fine local collections of beetles, formed respectively by Mr. John Gardner and Mr. Richard S. Bagnall, have been promised to the Society, on the understanding that they shall be combined with the late Thomas J. Bold's collection, already for many years in the museum, to form one large reference collection. This is an opportunity that should

not be missed, for the combined collection will certainly be the best of its kind in the country; but a suitable cabinet to contain it will cost £60 or £70. How this is to be provided is a question that the Council have at present under consideration; it is mentioned here in the hope that some of the members may volunteer help towards raising the sum needed.

As the financial statement shows, the year was begun with a considerable deficit. This was met, however, by special donations privately made for that object by some of the members; an act of generosity for which the best thanks of the Council and of the Society are due. Unfortunately the end of the year once more brings a deficit. About half of this is due to somewhat heavy items of expenditure incurred unexpectedly; the remainder represents the amount by which the cost of the Society's ordinary work has exceeded its income.

Against these regrettable features of the Society's position is to be set a circumstance which will tend to place its finances on a better footing. By the will of the late Mr. George E. Crawhall the Natural History Society receives a legacy of £6,000, to be invested for the benefit of the funds. This generous bequest is most opportune at the present time, and will obviously do much to relieve the many-sided strain upon the finances.

Your Council feel it important nevertheless to emphasise the fact that the Society will still, as much as ever, need all the support that can be obtained for it. It must be remembered that the full development and adequate upkeep of such a large museum, together with the active prosecution of the other lines of work undertaken by the Society, would cost a considerably larger sum annually than has ever yet been available. That this would be the case was fully realised by the founders of the present museum twenty-five years ago, and in their reports they strongly advocated the formation of a maintenance fund to ensure an income sufficient for the heavy responsibilities the Society had undertaken. So far but little has come of this project, though

the wisdom of it has become increasingly plain. Your Council therefore earnestly hope that, far from leading to any slackening of support, the late Mr. Crawhall's action will serve as an incentive to others to follow his example. Experience seems to show that there is little prospect of any great increase in the number of annual subscribers. Membership in such a body as the Natural History Society, where much in the way of personal return for the subscription is not expected, will naturally appeal only to a limited number. There is more to be hoped for from additions to capital brought about by further legacies; and nothing could give the Council more satisfaction than to see a substantial maintenance fund being in this way gradually built up, so that eventually the income from investments might suffice for the ordinary current expenses, leaving the members' subscriptions free year by year for such special purposes as the publication of transactions, the provision of new cases, and the purchase of specimens.

NEW MEMBERS ELECTED

FROM JULY, 1908, TO JUNE, 1909.

Henry Armstrong, The Grove, Jesmond.

Charles Cohen, 32, Osborne Road, Jesmond.

Wm. Egdell, c/o Mrs. Pease, Pendower, Benwell.

A. Fair, c/o Mrs. Pease, Pendower, Benwell.

Wm. W. Gibson, Orchard House, Low Fell.

J. J. Hill, M.S.A., Goldsmiths' Hall, Pilgrim Street, Newcastle.

Hon. James Arthur Joicey, Longhirst Hall, Morpeth.

Col. C. W. Napier-Clavering, Axwell Park, Co. Durham.

John G. Ormond, 35, Percy Gardens, Tynemouth.

Capt. R. M. Rodgers, Threaplands House, Moorfield, Newcastle.

Clarence D. Smith, Orchard House, Fenwick Terrace, Newcastle.

Lancelot Smith, Roseworth Cottage, Gosforth.

John Smith, 128, Rye Hill, Newcastle.

Dr. Clement Stephenson, Sandyford Villa, Newcastle.

Wm. Story, 26, Wingrove Road, Newcastle.

G. Manners Tate, 3, Lovaine Place, Newcastle.

Henry Temperley, 7, Lambton Road, Newcastle.

G. B. Turner, 101, Park Road, Newcastle.

ASSOCIATE MEMBERS

Charles Ernest Clague, 5, Saville Row, Newcastle.

William Douglas Clague, 5, Saville Row, Newcastle.

Alex. Cleghorn, School House, Mickley-on-Tyne.

Miss C. A. Cooper, 26, Fern Avenue, Jesmond.

Miss Jane Dinning, The School, Simonburn, Humshaugh.

Miss Annie Edmunds, 2, Lavender Gardens, Jesmond.

CURATOR'S REPORT ON MUSEUM WORK.

1908–1909.

It is once more in the zoology room that the chief work of the year has been done. The row of desk-cases illustrating the lower invertebrates, from Protozoa up to crustaceans and arachnids, has been finished as far as is possible at present. The fourth row of desk-cases is now the only one that has not been taken in hand; it is devoted to the insects, and the chief difficulty connected with it is the need for a large number of fresh specimens to replace old and now worthless material previously exhibited. Recent donations have provided us with a fair stock of butterflies to draw upon, but until some money is available for purchases there is little prospect of making up good representative sets of most of the other orders of insects. We hope soon, however, to make a beginning with some of the cases; and in preparation for this we have fitted covers over the glasses to keep the new specimens from the light. The covers are in the form of lids made of thin "three-ply" board, which seems to answer the purpose very well.

But the most important piece of work done in the zoology room has been the complete overhauling and re-installation of the fishes. In recent reports I have referred to the fishes as the most discreditable section of the museum collections. The specimens were overcrowded, many of them were thrown into shadow by the old wooden shelves, and all of them presented a monotonous brown colour. The labelling, too, was unsatisfactory, and the classification out of date. All these defects have now been remedied. The fishes have been coloured as nearly as possible to life, and are now shown up against a clean, tinted background, with no shelves to obscure the light. They have been re-arranged on a more natural and modern system of classification, and provided with clearly printed labels giving not only the name, but some information also regarding the habits and distribution of the fish. Much credit is due to Mr. Fletcher for the skill which he rapidly developed in painting the fishes in their natural colours.

Some minor changes in the zoology room are also worth mentioning. We have turned out a number of the store-cupboards and re-arranged their contents. The overhauling of the reptile cases has not yet been completed, but the tortoises' shells have been identified and arranged in natural order. The sponges of the Tankerville collection have been re-arranged to secure a better general effect, and I was able to identify nearly all of them through a recent visit to the Natural History Museum at South Kensington. The American bison presented by Mr. C. J. Leyland was mounted very finely by H. Brazenor of Manchester, and now forms an imposing centrepiece to the zoology room. The reproduction of a local rock pool, which we exhibited last year at the Royal Agricultural Show, has been placed on one of the pedestals at the west end of the room.

In the bird room two desk-cases have been overhauled and fitted up afresh. They represent chiefly some of the distinctive features of bird anatomy, and among the new preparations introduced are illustrations of the regions of plumage, wing and leg structure as compared with that of the limbs of other animals, different types of skulls and palates, etc. A few birds have been mounted, including the glossy ibises shot at Alnmouth. Not much has been done during the year in the fossil room, though the amount of work waiting there to be taken up is very great. Some necessary cleaning of the shelves and specimens is in progress.

The various pieces of work described above have naturally involved a large amount of labelling. For many of the labels the typewriter has been used; it is often quite suitable for the purpose, but on the other hand there are many labels for which typewriting would be too bulky and weak. For these some form of printing is necessary, and during this year we have been fortunate in securing at a low price a second-hand press that is excellently adapted to our requirements. The small hand press that we worked with previously had became quite useless. With the new press Miss Welford is turning out

very good labels for the fishes, and in future it will be of the greatest service to us in all sections of the museum. Specially large labels, such as those for the bison and for the main divisions of the library, have as usual been done by hand.

Other work that has been carried out by Miss Welford in the time left over from her routine duties has included the relaxing and setting of a large number of foreign lepidoptera, and the making of wrappers to contain the packets of plants in a collection sent from the south of France by Mr. Raine.

Some of the additions made to the museum collections during the year are particularly worthy of note. The American bison presented by Mr. Leyland has been referred to already. Mr. Harold Cookson has made a further addition to the beautiful set of heads and horns of African big game deposited by him in the museum; and the Rev. J. E. Hull has added fifty more species to the collection of local spiders which he had previously presented. A collection of Central African butterflies has been presented by Mr. R. R. Sharpe; and Africa has been further represented among the donations by a large number of natural history specimens—birds, shells, etc.—and objects of native workmanship received from Miss E. Dickinson. A valuable addition to the herbarium is the collection of over a thousand species of plants from the French Riviera sent by Mr. Frederic Raine; like all the other collections for which the Society has been indebted to Mr. Raine, this is a model of perfectly finished and systematic work. The two local examples of the glossy ibis presented by Mr. Thos. Jefferson are a most interesting accession to the bird room, and a species of British mammal new to the museum is represented by the Orkney voles presented by Mr. I. Clark. A certain number of specimens have also been acquired by exchange: for instance, a set of fossils from the Faxe (Cretaceous) beds of Denmark, received from Mr. S. J. Pindborg in exchange for some Coal Measure fossils and rock samples; and some good minerals obtained by an exchange of duplicates with Mr. P. Walther, who has also added

many specimens to this section of the museum as donations. Fuller particulars of the above accessions will be found in the complete list appended to the report.

Valuable help has been given to us in the work of the museum by several members of the Society and others. The Rev. W. McLean Brown has classified and arranged the collection of plants referred to above, and he also very kindly took my place at one of the "museum talks," with this collection as his subject. Mr. H. Eltringham has again helped us by identifying and arranging some African butterflies; Mr. R. Kirkpatrick of the Natural History Museum, South Kensington, has assisted me in identifying the Tankerville sponges; and Miss B. Freire-Marecco has sent some very useful notes on certain objects in our ethnological gallery. To all of these my best thanks are offered.

E. Leonard Gill.

MUSEUM STAFF

Curator.....E. Leonard Gill, M.Sc.

Assistant .....Herbert Fletcher.

Honorary Keeper..... .....Joseph Wright.

Lady Assistant and Secretary.....Miss E. Welford.

Attendant.....William Voutt.

Gardener .....Albert Spencer.

EVENING MEETINGS HELD DURING THE WINTER SESSION, 1908–1909.

Nov. 11.—Dr. D. Woolacott : "The Mechanics of Rock Movements" ; chair taken by Mr. J. Alaric Richardson.

Dec. 9.—Mr. Edward Potts : "Ingenious Contrivances in Plants" ; chair taken by Mr. W. Mark Pybus.

Jan. 13.—Dr. J. A. Smythe : "The Ice Age in South-East Northumberland" ; chair taken by Mr. Ernest Scott.

Feb. 10.—Miss M. Temperley, M.A. : "Movement in Plants" ; chair taken by Mr. Jos. G. Angus.

Mar. 10.—Dr. J. T. Dunn : "Metals, Ores and Minerals" ; chair taken by Mr. Geo. Jenkins.

Apr. 7.—Private Evening Meeting of the Society : Report on Field Meetings of the summer of 1908, by Mr. Edward Potts, Chairman of Field Meetings Committee ; reading by Mr. Chas. Robson (Birtley) of his Hancock Prize Essay, "A Day's Rambling in Mid-July."

AFTERNOON LECTURES TO CHILDREN

Dec. 30.—Rev. W. J. Wingate : "A Talk about Flies" ; chair taken by Mr. R. Coltman Clephan, F.S.A.

Jan. 6.—Rev. Arthur Watts, F.G.S. : "The Story of a Sand Grain" ; chair taken by Sir George Hare Philipson, D.C.L., F.R.C.P.

CURATOR'S "MUSEUM TALKS"

Oct. 28.—Some Recent Accessions.

Nov. 25.—Birds' Nests.

Dec. 16.—The Sportsman's Birds.

Jan. 27.—Horns and Hoofs.

Feb. 27.—A New Collection of Plants from the South of France (by the Rev. W. McLean Brown).

Mar. 31.—The Whales.

Apr. 28.—English Song Birds.

NATURAL HISTORY SOCIETY OF NORTHUMBERLAND, DURHAM, AND NEWCASTLE-UPON-TYNE

HONORARY OFFICERS OF THE SOCIETY

Elected at the Annual Meeting, October 14th, 1908

PATRON

The Right Hon. Lord Armstrong, M.A., D.C.L.

PRESIDENT

The Right Hon. Lord Joicey

VICE-PRESIDENTS

The Duke of Northumberland.
Viscount Ridley.
Lord Barnard.
Lord Ravensworth.
The Bishop of Durham.
The Bishop of Newcastle.
Sir Hugh Bell, Bart.
Sir Arthur Middleton, Bart.
Sir Andrew Noble, Bart., F.R.S.
Sir G. H. Philipson, M.D., D.C.L.
Sir John Swinburne, Bart.
Sir Lindsay Wood, Bart.
The Lord Mayor of Newcastle.
Sir Isambard Owen, M.A., M.D.
Lt.-Col. C. H. E. Adamson, C.I.E.
Lt.-Col. W. M. Angus, C.B.
Prof. G. S. Brady, M.D., F.R.S.
E. J. J. Browell.
R. Coltman Clephan, F.S.A.
Norman C. Cookson.
Geo. E. Crawhall.
W. D. Cruddas.
R. R. Dees.
D. O. Drewett.
Samuel Graham.
H. N. Middleton.
John Pattinson, F.I.C.
Prof. M. C. Potter, M.A., Sc.D.

COUNCIL

Hugh P. Angus.
G. A. Atkinson.
Harry Benson.
Rev. W. McLean Brown.
John L. Gracie.
T. E. Hodgkin, M.A.
George Jenkins.
Hon. J. Arthur Joicey.
J. Alaric Richardson
Ernest Scott
C. E. Stuart, B.Sc.
J. D. Walker.

HON. SECRETARIES

N. H. Martin, F.R.S.E. | C. E. Robson.

HON. TREASURER

A. H. Dickinson.

HON. AUDITOR

Samuel Graham.

LIST OF DONATIONS

FOR THE YEAR ENDING JUNE 30TH, 1909

HUGH P. ANGUS.—Fifteen well-mounted birds in cases, including a plantain-eater, *Turacus livingstoni*, two trogons, *T. collaris* and *T. viridis*, a coucal, *Centropus bengalensis*, two Australian ibises, *I. molucca*, etc. The head of a fulmar picked up near Newbiggin in June.

DR. W. D. ARNISON.—Some British lepidoptera and other insects.

ANGUS BAGNALL.—A hollow clay-ironstone concretion showing successive layers in the shell.

COUN. E. H. BOSTOCK.—A young male chacma baboon, *Cynocephalus porcarius*.

MR. BROWN (Warkworth Station) per W. Mark Pybus.—A water rail picked up at Warkworth.

COL. R. H. CARR-ELLISON.—Deposited on loan: A fasciculus of grasses, 35 species, with their seeds, published at Gateshead, 1806, by John Thornhill. Also a small cabinet containing drawers.

JAMES CAYGILL.—Some pressed plants collected by the donor about Consett and in Teesdale. Fossil plants from the Brockwell seam, Consett; rock and mineral samples from Consett and Cauldron Snout.

MR. CHARLTON.—A kitten monstrosity, with limbs of another embryo attached.

ISAAC CLARK, junr.—Two capercaillie chicks in down, from the Trossachs. Five adults and one young of the Orkney vole, *Microtus orcadensis*, Millais, from the Orkneys.

MRS. COOCH (Bulawayo.)—Two heads of "love beans" in pod and two "vegetable ivory" fruits from Zambesia.

HAROLD COOKSON.—Deposited on loan: further big game heads from Central Africa, namely mounted heads of sable antelope, Lichtenstein's hartebeest, male and female yellow-backed duiker, and hunting dog; and eighteen skulls or pairs of horns, including eland, sable antelope, bushbuck, lion, etc.

GEO. E. CRAWHALL (the late).—Skins of golden plover and knot, the latter shot inland at Elsdon in September. Three swallows, obtained by request for the Hancock collection; one a variety with white patch on chin.

C. W. Cruddas.—A brass coin of Antoninus Pius, from the Roman Wall near Haltwhistle.

Miss E. Dickinson (Jarrow.)—A large number of natural history and ethnological objects from South Africa, including six bird skins (an eagle, three kingfishers, two sunbirds); shell of a tortoise, *Testudo geometrica*; sponges, zoophytes, echinoderms, etc., and many mollusca from Algoa Bay; native work in wire, beads, soapstone, etc. from Bechuanaland, Basutoland and other districts; photographs of natives and of Bushman paintings.

Ralph Dixon (Great Ayton.)—A number of fasciculi of dried plants: Wm. Mudd's "Herbarium Lichenum Britannicorum," 1861, 3 fasc., 100 species in each; Nylander's "Herbarium Lichenum Parisiensium," 1st fasc.; two fasc. British flowering plants; one of lichens, mosses, hepatics, algæ, etc.

Hon. and Rev. Wm. Ellis.—A young partridge of the brown *(montana)* variety from Bothal.

Saml. Graham.—Nests and eggs of arctic tern (2) and lesser black-backed gull; two adders killed at Bellingham on April 6th; a piece of pine timber showing a curious structure.

Chas. S. Greenhow.—Four samples of Cornish serpentines.

W. H. Hardy (Three Mile Bridge Nurseries.)—A case containing three herons from Acklington; one old bird and two young.

Ald. Geo. Harkus.—Internal flint cast of a Cretaceous sea-urchin, *Echinoconus conicus*, picked up at Windsor.

Mrs. Harpur (Nenthead.)—Internal flint cast of a Cretaceous sea-urchin, *Micraster sp.*, from the chalk of Kent.

G. E. Henderson.—A piece of native bark cloth from Entebbe, Uganda.

Rev. J. E. Hull, M.A.—Fifty further species of spiders to add to the local reference collection given previously (1895 and 1908) by the same donor.

Thos. Jefferson (Alnmouth.)—Two immature glossy ibises, *Plegadis falcinellus*, shot out of a party of five at Alnmouth (see Transactions, present volume, page 221.)

Dr. von John.—A microscope slide of minute crystals of diamond, formed from sugar carbon under high temperature and pressure in an explosion chamber.

S. T. King (Hartlepool.)—A turbot equally pigmented on both sides. A keg of living sea anemones, *Tealia* and *Actinoloba*.

Col. M. H. Lambert.—A core of grit from a boring at Houndalee Farm, Widdrington, depth 34 fathoms.

C. J. Leyland.—An American bison, an old bull, the last of the original pure stock in the herd at Haggerston Castle, Northumberland; died July, 1908.

F. Longstaff.—A young male osprey, *Pandion haliaëtus*, found wounded (probably by a telegraph wire) at Newbiggin.

Archd. E. MacDonald.—A corncrake killed against telegraph wires near Newcastle on April 26th. A large *Modiola* shell.

Montagu Maclean.—A hawfinch found in the grounds of Morwick Hall, near Acklington, at the end of January.

D. Mallett.—Samples of rock beds associated with particular coal seams at Hazelrigg pit.

N. H. Martin.—A sponge of the genus *Muricina*.

Chas. Marshall (Durham.)—A little gull, *Larus minutus*, shot at Bamburgh, Dec., 1906; set up by the donor.

Sir Arthur E. Middleton.—Sandstone cast of a *Calamites* stem from a quarry at Belsay Castle.

Miss Miller.—A small parrot, *Pœocephalus versteri*, a native of the Niger country; died in captivity.

J. J. Oxley.—A young harp seal, *Phoca grœnlandica*, in pure white fur, well stuffed; from Notre Dame Bay, Newfoundland. Sample of molybdenum ore from Hermitage Bay, Newfoundland.

Mrs. Pease (Pendower)—A well preserved frond of *Neuropteris gigantea* in a clay-ironstone nodule from Benwell.

S. J. Pindborg (Copenhagen.)—In exchange for some local fossils: a set of fossils from the Faxe beds (étage danien) of the Danish Cretaceous.

Fredc. Raine.—A collection of plants from the neighbourhood of Hyères on the French Riviera, 1,010 sheets, excellently prepared. Also two green lizards, *Lacerta viridis*, from Hyères, one an unusually large example.

A. W. Rymer Roberts (Windermere.)—Examples of some of the rarer land shells (species of *Hyalina*, *Helix*, *Hygromia*, etc.) to add to the Alder collection.

CHAS. ROBSON (Birtley.)—A series of examples of the bee *Bombus venustus* taken at Birtley.

R. R. SHARP.—A collection of butterflies (in papers) caught recently by the donor in the Katanga district, Congo Free State.

GEO. SISSON.—A large stone crab, *Lithodes maia*, bought in Shields fish market. A framed set of coloured figures of young salmon in various stages, with description by Yarrell.

LAWRENCE SMITH.—Nest of the humble bee *Bombus venustus* from Shetland.

STANLEY SMITH, B.Sc.—Specimens of six fossil corals from the limestones of Northumberland.

MRS. (EMMA) STANLEY (London.)—A fine embroidered satin quilt, believed to be German of the 17th century.

B. STORROW.—An example of the rare long-armed starfish *Astronyx loveni* from off Aberdeen.

SUNDERLAND MUSEUM.—A large collection of Japanese moths, made in North Japan by the Rev. Walter Andrews.

H. C. SWAN (Auckland, New Zealand, per J. D. Walker.)—A group of highly polished pebbles from the gizzard of a moa, *Dinornis*, turned up by the plough near Auckland.

MISS VUST.—A kitten monstrosity.

CHRISTOPHER WALKER.—A flint nodule containing a beautifully preserved shell of *Spondylus spinosus*.

P. WALTHER.—A group of oysters from a ship's bottom. Various minerals, including samples of the potash minerals of Stassfurt, trona from Africa, altered coal and roof-bed from a Scotch seam; a clay-ironstone nodule containing a *Lepidostrobus*. Also, by exchange: a set of chalk fossils—echinoderms, sponges, corals, etc.—including a remarkable spiral fossil which the experts of the London museums are unable to identify; and a large number of minerals, e.g. a set of the rare minerals of Styria, brown tourmaline crystals, opal pseudomorphic after serpentine, chalcedony with included liquid and bubble, jamesonite, sagenite, rhipidolite, yellow and red griqualandite, etc.

G. H. WARREN (per W. N. Mangin.)—Four dogs, well mounted by Rowland Ward; a retriever, two St. Bernards, and an Esquimo dog.

C. W. White (Blanchland.)—A good piece of *Stigmaria* showing the pith groove, from sandstone near Blanchland.

Miss Wilkinson and Mrs. Craven.—A very fine pair of elk (moose) antlers from North America, brought over by the donors' father, the late J. W. Wilkinson.

H. B. Wilson.—A female double-banded finch from Australia; died in captivity.

SPECIAL DONATIONS TOWARDS DEFICIT

	£	s.	d.
Sir Andrew Noble	25	0	0
Sir Lindsay Wood	25	0	0
Col. Adamson	20	0	0
W. D. Cruddas	10	0	0
Lord Ridley	10	0	0
Norman C. Cookson	5	0	0
Axel F. Ericsson	5	0	0
Thos. Taylor (Chipchase Castle)	5	0	0
	£105	0	0

SUBSCRIPTIONS TO BISON FUND

	£	s.	d.
Wilfred Hall	10	10	0
Col. C. H. E. Adamson.	5	0	0
G. E. Crawhall	5	0	0
John L. Gracie	5	0	0
E. J. J. Browell	2	2	0
W. E. Beck	2	2	0
N. H. Martin	2	2	0
T. E. Hodgkin	2	2	0
John Pattinson	2	2	0
J. Alaric Richardson	2	2	0
John D. Walker	2	2	0
Mrs. Pease	2	0	0
Hugh P. Angus	1	1	0
G. A. Atkinson	1	1	0
Harry Benson	1	1	0
R. Coltman Clephan	1	1	0
Samuel Graham	1	1	0
A. H. Dickinson	1	0	0
George Jenkins	1	0	0
C. E. Stuart	0	10	6
	£49	19	6

SUBSCRIPTIONS TO PUBLICATION FUND, 1909

	£	s.	d.
The Rt. Hon. Lord Joicey	10	10	0
G. E. Crawhall	5	5	0
Right Hon. Lord Ravensworth	5	0	0
Sir Lindsay Wood, Bart.	5	0	0
John L. Gracie	5	0	0
W. E. Beck	3	3	0
Sir Gainsford Bruce	2	2	0
J. H. B. Noble	2	2	0
N. H. Martin	2	2	0
John Pattinson	2	2	0
R. Coltman Clephan	2	2	0
Mrs. Clay	2	2	0
Mark Archer	2	2	0
George Sisson (two subscriptions)	2	0	6
Col. C. Napier Clavering	1	1	0
Henry T. Mennell	1	1	0
Dr. Gibb	1	1	0
Dr. G. S. Brady	1	1	0
Dr. Clement Stephenson	1	1	0
Thomas Bell	1	1	0
Dr. Randell Jackson	1	1	0
E. J. J. Browell	1	1	0
Thomas Pumphrey	1	1	0
C. E. Robson	1	1	0
Hugh P. Angus	1	1	0
Rev. Arthur Watts	1	1	0
Prof. D. Oliver	1	1	0
John D. Walker	1	1	0
Mrs. Pease	1	1	0
J. A. Richardson	1	1	0
C. E. Stuart	1	1	0
Col. Adamson	1	0	0
George W. McLean	1	0	0
Charles L. Bell	1	0	0
Harry Benson	1	0	0
Saxton Noble	1	0	0
G. A. Atkinson	0	10	6
Thomas Simpson	0	10	6
Dr. D. Woolacott	0	10	6
Edward Potts	0	10	6
Dr. Smythe	0	10	6
Alf. J. A. Woodcock	0	10	6
John Wilson	0	10	6
George Hadaway	0	10	6
George Jenkins	0	10	0
Thomas Jones	0	10	0
John Smith	0	10	0
Winship Greenwell	0	10	0
G. B. Turner	0	10	0
Matthew Mackey	0	10	0
Miss Eleanor Cruddas	0	10	0
H. I. Brackenbury	0	10	0
Miss Heslop	0	10	0
Miss J. Dinning	0	5	0
"A Member"	0	5	0
	£82	13	6

ADDITIONS TO THE LIBRARY

BY EXCHANGE AND DONATION

FROM JULY 1ST, 1908, TO JUNE 30TH, 1909

BRITISH SOCIETIES AND INSTITUTIONS

Berwick-upon-Tweed:—Berwickshire Naturalists' Club.
History of the Club, vol. 20, part 1.

Cambridge University:—Philosophical Society.
Proceedings, vol. 14, parts 5–6; vol. 15, parts 1–2.
Report for 1907.

Cardiff:—Museum and Art Gallery.
Report of the Welsh Museum for 1908.

Cardiff:—Naturalists' Society.
Transactions, vol. 41.

Dublin:—Royal Dublin Society.
Scientific Transactions, vol. 9, nos. 7–9; title and index.
Scientific Proceedings, vol. 11, nos. 21–32, with index; vol. 12, nos. 1–13.
Economic Proceedings, vol. 1, nos. 12–15.

Edinburgh:—Botanical Society.
Transactions and Proceedings, vol. 23, parts 3-4.

Greenwich:—Royal Observatory.
Results of the Magnetical and Meteorological Observations, 1906.

Ipswich:—Museum and Free Library.
59th Annual Report.

Leicester:—Public Museum and Art Gallery.
16th Annual Report.

London:—British Association for the Advancement of Science.
Report of 78th Meeting, Dublin, 1908.

London:—British Museum (Natural History), South Kensington.

Guide to Horse Family.
,, Exhibited Series of Insects.
,, Elephants (Recent and Fossil).
,, Fish Gallery.
,, Domesticated Animals.
,, Whales, Porpoises and Dolphins.
,, Anthropology in Zoological Department.
Catalogue of Lepidoptera Phalænæ, vol. 7 and plates.
,, Fresh-water Fishes of Africa.
Synopsis of British Basidiomycetes.
Introduction to Study of Rocks, 4th edn.
,, ,, Meteorites, 10th edn.

London:—County Council: Horniman Museum.

6th Annual Report.

London:—Quekett Microscopical Club.

Journal, ser. 2, vol. 10, nos. 63–64.

London:—Zoological Society.

Proceedings, 1908, in 4 parts; 1909, part 1.
Transactions, vol. 18, parts 2–3.
List of Fellows for 1908.

Maidstone:—Public Museum, Library, and Art Gallery.

Annual Report for 1908.

Manchester:—Literary and Philosophical Society.

Memoirs and Proceedings, vol. 52, part 3; vol. 53, parts 1–2.

Manchester:—Manchester Museum, The University.

Report, 1907–8.

Millport:—Marine Biological Association of the West of Scotland.

Annual Reports for 1907 and 1908.

Newcastle-on-Tyne:—North of England Institute of Mining and Mechanical Engineers.

Transactions, vol. 58, parts 4–7; vol. 59, parts 1–2.
Annual Report, 1908–9.

Newcastle-on-Tyne:—Northumberland Sea Fisheries Committee.

Report on the Scientific Investigations for 1907.

Northampton :—Northamptonshire Natural History Society and Field Club.

Journal, vol 14, nos. 113-116.

Norwich :—Norfolk and Norwich Naturalists' Society.

Transactions, vol. 8, part 4.

Norwich :—Castle Museum.

Museum Report for 1908.

1st Annual Report of the Norwich Museum Association.

Oxford :—Ashmolean Natural History Society.

A Historical Account of the Society from 1880-1905.

Perth :—Perthshire Natural History Museum.

Annual Report for 1907-8.

Peterborough :—Natural History and Archæological Society.

35th Annual Report.

Plymouth :—Municipal Museum and Art Gallery.

9th Annual Report, 1907-8.

Rowlands Gill :—Vale of Derwent Field Club.

Transactions, vol, 1, part 1.

Stone, Staffs. :—North Staffordshire Field Club.

Annual Report and Transactions, vol. 42.

Stratford, Essex :—Essex Field Club.

"The Essex Naturalist," Index to vol. 14; vol. 15, parts 4-6.

Warrington :—Borough Museum.

Annual Report for 1907-8.

Worcester :—Public Library, Museum, and Art Gallery.

Report of Committee, 1907-8.

York :—Yorkshire Philosophical Society.

Annual Report for 1907.

COLONIAL SOCIETIES AND INSTITUTIONS

Cape Town :—South African Museum.

Report for 1907.

Annals, vol. 4, part 8; vol. 5, part 6; vol. 6, part 2; vol. 7, parts 1-3.

Halifax, Nova Scotia :—Nova Scotian Institute of Science.

Proceedings and Transactions, vol. 11, parts 3-4; vol. 12, part 1.

Melbourne:—National Museum.
Memoirs, no. 2.

Ottawa:—Department of the Interior.
"Canada's Fertile Northland"; text and maps.

Ottawa:—Geological Survey of Canada.
Summary Reports, nos. 982, 986, 996, 1028.
Thirty-four Geological Survey Maps.
Report on Nova Scotia (1021) for 1907.
Geology and Mineral Resources of New Brunswick (983).
Contributions to Canadian Palæontology, vol. 3, part 4.
Report on Tertiary Plants of British Columbia.
Summary Report for 1908.
Preliminary Report on Gowganda Mining Division (1075).

Sydney, N.S.W.:—Australian Museum.
Report of Trustees for 1908.
Records, vol. 7, nos. 2–3.

Sydney, N.S.W.:—Royal Society of New South Wales.
Journal and Proceedings, vols. 37–41.

Sydney, N.S.W.:—Technological Museum.
Annual Reports 1906 and 1907.

Western Australia:—Geological Survey.
Bulletin, nos. 31, 32, and 34.
Report on the Northampton Mineral Field.
Report on the Kanowna Mines.
Report on the Yilgarn Goldfield.

Australasian Society for the Advancement of Science.
11th Annual Report—Adelaide Meeting.

AMERICAN SOCIETIES AND INSTITUTIONS

UNITED STATES OF AMERICA

Ann Arbor:—Michigan Academy of Science.
10th Annual Report.

Berkeley:—University of California.
"Zoe," vols. 1–5.
Geological Bulletin, vols. 1–4; vol. 5, parts 1-15, 17.
Botanical Bulletin, vols. 1–2; vol. 3, parts 1–5.
Zoological Publications, vols. 1–4; vol. 5, part 1; vol. 6, part 1.
List of Exchanges for 1909.

Boston:—Society of Natural History.

Proceedings, vol. 34, nos. 1–4.
Occasional Papers, nos. 8–10.

Boston:—American Academy of Arts and Sciences.

Proceedings, vol. 43, nos. 17–22; vol. 44, nos. 1–17.
Memoirs, vol. 13, no. 6.

Brooklyn, N. Y.:—Institute of Arts and Sciences.

Science Bulletin, vol. 1, nos. 14, 15.
Cold Spring Harbor Monographs, no. 7.

Buffalo:—Society of Natural Sciences.

Bulletin, vol. 9, no. 2.

Cambridge:—Museum of Comparative Zoology, Harvard College.

Bulletin, vol. 43, no. 6; vol. 52, nos. 1–8; vol. 53, nos. 1–2.
Bulletin, Geological Series, vol. 8, no. 7.
Memoirs, vol. 26, no. 6; vol. 34, no. 2; vol. 37.
Annual Report of the Curator, 1907–08.

Chicago:—Academy of Sciences.

Special Publication, no. 2.

Chicago:—Field Columbian Museum.

Geological Series, vol. 3, no. 7.
Report, vol. 3, no. 3.

Columbus:—Ohio State University.

Bulletin, vol. 12, no. 7, Supplement B to no. 8, no. 12, no. 13 and Supplement, no. 15.
Address by Rev. W. Gladden.
Address by Hon. E. A. Jones, Ph.D.

New York:—Academy of Sciences.

Annals, vol. 2, no. 12; vol. 3, nos. 10–12; vol. 5, extra nos. 1–3 and 9–12 and index; vol. 6, nos. 7–12 and index; vol. 18, part 2.
Transactions, vol. 4; vols. 6–13.

Philadelphia:—Academy of Natural Sciences.

Proceedings, vol. 60, nos. 1–3; vol. 61, no. 1.

Philadelphia:—American Philosophical Society.

Proceedings, vol. 47, nos. 188–190.

Pittsburg:—The Carnegie Museum.

11th Annual Report.

Springfield :—Natural History Museum.

Annual Report for 1908.

St. Louis :—Academy of Science.

Transactions, vol. 16, nos. 8–9 ; vol. 17, nos. 1–2 ; vol. 18, no. 1.

St. Louis :—Missouri Botanical Garden.

19th Annual Report.

Washington :—Smithsonian Institution.

Annual Report for 1907.

Miscellaneous Collections, vol. 49, title-page and contents ; vol. 51, parts 1–2 ; vol. 53, parts 1–5 ; Quarterly Issue, vol. 5, nos. 1–2.

Smithsonian Contributions to Knowledge, title-page and contents of vol. 34.

Addenda to Annals of the Astrophysical Observatory, vol. 2.

Classified List of Smithsonian Publications, May, 1908.

Washington :—Smithsonian Institution, U.S. National Museum.

Bulletin, nos. 61–62.

Proceedings, vols. 33–34.

Publication no. 1639.

Contributions from the U.S. National Herbarium, vol. 10, title and index ; vol. 12, nos. 1–6.

Washington :—United States Geological Survey.

29th Annual Report, 1907–8.

Mineral Resources of the U.S., 1907.

Monograph 49.

Bulletins, 328, 329, 332, 335, 337–8, 340, 342, 344–55, 357–9, 361–7, 369.

Professional Papers, 56, 58, 60–63.

Water-supply Papers, nos. 211–12, 218–222, 226.

SOUTH AMERICAN STATES, ETC.

Mexico :—Instituto Geologico.

Boletin, num. 17 and 26.

Parergones, tomo 2, num. 4–9.

EUROPEAN SOCIETIES AND INSTITUTIONS

Bergen :—Bergens Museum.

Aarbog, 1908, hefte 1–2.

Aarsberetning for 1908.

Crustacea of Norway (G. O. Sars), vol. 5, parts 21–24.

Christiania :—Videnskabs-Selskabet.
Forhandlinger, 1907.

Copenhagen :—Naturhistoriske Forening.
Videnskabelige Meddelelser, 1908.

Dresden :—Naturwissenschaftliche Gesellschaft "Isis."
Sitzunsberichte und Abhandlungen, Juli-Dez. 1908.

Frankfurt-am-Main :—Senckenbergische Naturforschende Gesellschaft.
Bericht, 1907–8.

Hamburg ;—Naturwissenschaftlicher Verein.
Verhandlungen, 1875–1881 ; 1893–1905, 1907.
Abhandlungen, vol. 1 ; vol. 2, parts 1–2 ; vol. 3 ; vol. 4, parts 2–4 ; vol. 5, parts 1–4 ; vol. 6 ; vol. 7, parts 1–2 ; vol. 8, parts 1–3 ; vol. 9, parts 1–2 ; vol. 10 ; vol. 11 parts 1–3 ; vol. 12 ; vol. 13 ; vol. 14 ; vol. 15 ; vol. 16, parts 1–2 ; vol. 17 ; vol. 18.
Special Memoirs, 1876.

Helsingfors:—Societas pro Fauna et Flora Fennica.
Acta, vols. 29–31.
Meddelanden, parts 33–34.
Festschrift, band 1–2.

Kiew, Russia:—Société des Naturalistes.
Mémoirs, tome 20, part 2.

Lisbon :—Société Portugaise des Sciences Naturelles.
Bulletin, vol. 2, fasc. 1–2.

Marseille :—Bibliothèque de la Faculté des Sciences.
Annales, tome 16 and 2 supplements ; tome 17.

Paris :—Muséum d'Histoire Naturelle.
Bulletin, 1908, nos. 1–7.

Rennes :—Université de Rennes.
Travaux Scientifiques, tome 6, parts 1–2.

Stockholm :—Kongliga Svenska Vetenskaps-Akademien
Handlingar, vol. 42, nos. 10–12 ; vol. 43, nos. 1–6.
Arsbök, 1908.
Arkiv for Botanik, vol. 7.
,, Zoologi, vol. 4.
,, Matematik, Astronomi och Fysik, vol. 4.
,, Kemi, Mineralogi och Geologi, vol. 3, nos. 1–2.

Trencsen :—Naturwissenschaftlicher Verein.

Jahresheft, 1906–7.

Upsala :—Geological Institution, University of Upsala.

Bulletin, vol. 8, nos. 15–16.

Publications for the Linnean Celebration, May, 1907 :—8 vols., including a monograph on portraits of Linneus; volume of his correspondence; reprints of theses presented at the Celebration, &c.

"Letters of Carl von Linné."

"Swedish Explorations in Spitzbergen, 1738–1908."

Vienna :—K. k. zoologisch-botanische Gesellschaft.

Verhandlungen, Bd. 58.

MISCELLANEOUS.

"Rhopalocera Malayana: a description of the Butterflies of the Malay Peninsula," by W. L. Distant.

Presented by Col. C. H. E. Adamson, C.I.E.

"Fauna of British India," Mollusca.

" " Rhynchota, vol. 4, part 2.

Presented by the Secretary of State for India in Council (India Office).

"The Crustacea of Devon and Cornwall," by Canon Norman and Dr. Thos. Scott.

Reprints of papers by Rev. Canon Norman, M.A., F.R.S. :—

"The Podosomata of the Temperate Atlantic and Arctic Oceans."

"The Celtic Province; its extent and its marine fauna."

Presented by Canon A. M. Norman.

Natural History Transactions of Northumberland, Durham, and Newcastle-on-Tyne, vol. 1., part 1.

Natural History Series—"Birds," and "The Aquarium," by P. H. Gosse.

Presented by Mr. George Luckley.

"Growth of the Salmon in Fresh Water," with 6 coloured plates, by W. Yarrell. *Presented by Mr. George Sisson.*

"Map and Plotted Vertical Sections of Strata of the Northumberland and Durham Coalfield," 1908 (large folio), with explanatory supplement, by John Kirsopp, jun., M.I.M.E., F.G.S.

Presented by the Author.

Reprint of paper by Dr. F. A. Bather, F.R.S. :—

"Eocidaris, and some species referred to it" (describing specimens in the Hancock Museum). *Presented by the Author.*

Transactions of the English Arboricultural Society; vols. 1–5 complete (except vol. 2, part 1, and vol. 4, part 1).

Presented by the Committee of Armstrong College, Newcastle-on-Tyne.

"Thoughts on Natural Philosophy and the Origin of Life," by A. Biddlecombe, Newcastle. *Presented by the Author.*

Zoological Society of London:—

Annual Report for 1906.

List of Fellows, 1906 and 1908.

Proceedings, 1906, parts 1–4; 1907, parts 2–4; 1908, parts 1–3.

Zoological Record, vols. 41–43.

Transactions, vol. 17, parts 4 and 6; vol. 18, parts 1–3.

Presented by Major Geo. J. W. Noble.

Reprints of papers by Charles Janet (Paris):—

"Remplacement des Muscles vibrateurs du vol par des colonnes d'Adipocytes."

"Sur un Organe non décrit du thorax des Fourmis ailées."

"Histolyse, sans phagocytose, des Muscles vibrateurs du vol, chez les reines des Fourmis."

"Histogénèse du Tissu adipeux remplaçant les Muscles vibrateurs histolysés après le vol nuptial, chez les reines des Fourmis."

"Histolyse des Muscles de Mise en place des ailes, après le vol nuptial, chez les reines de Fourmis."

"Anatomie du Corselet et Histolyse des Muscles vibrateurs, après le vol nuptial, chez la reine de la fourmi Lasius niger." Texte et planches.

Presented by the Author.

"The Ibis," 9th series, vol. 2 (jubilee volume).

Presented by A. H. Evans, M.A.

"The Anatomy, Habits and Psychology of Chironomus pusio, Meigen (the early stages)," by Arthur Terry Mundy.

Presented by Mrs. Mundy.

Lydekker, "The Sportsman's British Bird Book."

Presented by Messrs. Rowland Ward.

G. S. West, M.A., D.Sc.: "British Desmidiaceæ," vol. 3.

From the Ray Society (by subscription).

"Museums Journal," July, 1908, to June, 1909.

From the Museums Association (by subscription).

"Nature," July 1st, 1908, to June 30th, 1909.

Presented by the Publishers.

THE HONORARY TREASURER IN ACCOUNT WITH THE NATURAL HISTORY SOCIETY

CURRENT ACCOUNT FROM 1ST JULY, 1908, TO 30TH JUNE, 1909

RECEIPTS.	£	s.	d.
Members' Subscriptions	382	2	0
Museum Admission Fees	162	3	0
Sale of Guide Books, &c.	6	16	1
Interest on Investments	163	17	6
Special Donations toward 1907–8 Deficit	105	0	0
Sundries	1	5	2
Deficit	85	17	4
	£907	1	1

PAYMENTS.	£	s.	d.
Balance due Treasurer	64	14	2
Salaries	553	2	10
Advertising	10	13	6
Fuel, Lighting, and Water	52	1	11
Insurance	28	7	7
Materials and Fittings	46	19	5
Postage and Carriage	16	9	5
Printing	25	15	0
Property Tax	9	3	4
Building Repair Fund	40	0	0
Stationery	5	1	7
Sundries	39	4	10
Balance of Bison Fund	15	7	6
	£907	1	1

BISON FUND.

	£	s.	d.
Donations	49	19	6
Balance transferred to General Account	15	7	6
	£65	7	0

	£	s.	d.
H. Brazenor—Mounting bison	22	10	0
Robson and Sons—Case, &c.	39	19	0
Carriage of bison	2	18	0
	£65	7	0

SAML. GRAHAM, Hon. Auditor.

A. H. DICKINSON, Hon. Treasurer.

BUILDING REPAIR FUND

	£	s.	d.
Balance, 30th June, 1908	16	16	0
To Cash	40	0	0
	£56	16	0

	£	s.	d.
E. Wardropper—Painting museum rails, &c.	13	0	0
G. G. Laidler—Repairing glass roof	5	14	1
Robson & Coleman—Repairing electric installation	12	3	7
Sundries	9	5	3
Balance	16	13	1
	£56	16	0

SPECIAL PUBLICATION ACCOUNT

	£	s.	d.
Balance in Bank, 30th June, 1908	46	16	5
Members' Subscriptions paid to date	70	12	0
Sale of Society's Transactions	2	7	3
Interest on Account	0	4	1
	£119	19	9

	£	s.	d.
*Printing and Lithographing	54	12	2
Postage and Carriage	5	2	5
Balance in Bank, 30th June, 1909	60	5	2
	£119	19	9

* In addition to this there is an outstanding liability for printing for £44 9s. 6d. (paid 19-8-09).

INVESTMENTS

The following is a list of the Investments held by the Society, June 30th, 1909 :—

	£	s.	d.
Newcastle Corporation Irredeemable Stock at 3½ per cent. (Coppin Bequest)	2,000	0	0
River Wear Commission Funded Debt at 4½ per cent.	500	0	0
Tyne Commissioners' Consolidated Fund at 4 per cent.	2,000	0	0
	£4,500	0	0

SAML. GRAHAM, Hon. Auditor.

A. H. DICKINSON, Hon. Treasurer.

PAPERS ON SPIDERS

By the Rev. J. E. Hull, M.A.

I.

The Genus TMETICUS (Simon, 1884; Cambridge, 1900) and some Allied Genera

The species whose systematic position I now propose to discuss are the British representatives of the very heterogeneous group included under the name *Tmeticus* by M. Simon (Arach. de France, 1884; Hist. Nat. des Araignées, 1894) and the Rev. O. Pickard-Cambridge (List Brit. and Ir. Spiders, 1900), together with the species of *Hilaira* enumerated by both authors. To these must be added certain species discovered since 1900, and a few others which have been assigned to other genera, though really belonging to this alliance.

Thus constituted, the group falls into two obvious sections—*Centromerus*, in which the outer falcal teeth are three, the maxillæ quadrate, the labium short and very broad, the front eyes very unequal, while the femora of the first pair of legs (at least) bear a spine or spines; and all the remaining species, which have four or five outer falcal teeth, oblong maxillæ, a labium comparatively long, the front eyes not so diverse in size, and no femoral spines at all.

Centromerus is now generally recognized as an established genus, and only one author, the Norwegian arachnologist Mr. E. Strand, has proposed a sub-division. For the two very nearly related species *bicolor* Bl. and *concinnus* Thor. he proposes the genus *Centromeria*—a proposition not to be lightly set aside. The two species differ conspicuously from all the rest of the section, in that all the tibiæ are armed underneath with a double series of spines, while all the dorsal spines of the tibiæ are alike, not stronger on the posterior legs than on the anterior as in all the other species: the surface of the falces is not granulate, and the copulatory organs are of a slightly different type.

The development of the paracymbium of the male palpus is a characteristic feature of the *Centromeri*. This paracymbium is a chitinized branch of the tarsus, springing from its inner surface near the base and outer margin, behind the attachment of the bulb. In the *Centromeri* the base of attachment is comparatively large, and the limb is continuous with the upper surface of this basal part, which in the larger species is usually smooth and chitinous. In some species of lesser size (notably in *emptus*) it is only imperfectly chitinized and more or less covered with bristly hairs; but always it has the appearance of forming part of the complete crescentic sweep of the limb, never breaking the outline, and indeed usually produced on the side opposite to the main limb. Including the whole of this circuit, the paracymbium covers about three-fourths of a circle, but is much broader in the middle than at either extremity, and the inner surface is concave. It is so attached to the tarsal surface that when the palpus is viewed from the outer side nearly the whole inner surface is visible.

Typically the epigyne of the female presents a vulvar fovea, wider than long, divided by a more or less heartshaped central process. The attachment of this process is near the anterior margin, the middle of which is often produced backwards so as to overlap it considerably.

Throughout the genus two dorsal spines on each tibia is the rule, the spines of the posterior legs being longer and stronger (usually darker) than those on the anterior legs. The femoral spines vary. For the majority of species the formula is—femur i., 2 or 3; femur ii., 1 or 2; femora iii. and iv., 0 or 1; but there is a small group, of which *serratus* Sim. is the only British example, in which femur i. bears a solitary spine, and the rest are spineless. The larger species have a single feeble spine on each metatarsus.

Obviously the correct systematic position of *Centromerus* is with *Porrhomma* and *Bathyphantes* between *Lephthyphantes* and *Microneta*, a series which ought not to be broken by the intrusion of the remaining species now under review. The

latter form a continuous series lying between *Drapetisca* and *Gongylidium*, in which the predominating characters are what I should be disposed to call Nerienine, as distinguished from Linyphiine.

At the head of this series—so near to *Linyphia* as hardly to be included in the present group—is the genus *Mengia*, which is very closely allied to *Drapetisca*. They bear pretty much the same relationship to each other as *Linyphia (Helophora) insignis* Bl. bears to *L. montana* Clk., but the difference is not nearly so great, as a glance at the copulatory organs will show. To be consistent, whoever includes *insignis* in the genus *Linyphia* would naturally assign the two species of *Mengia* to *Drapetisca*. They differ from *Drapetisca* in having no femoral spines, but that is a difference which exists within the genus *Linyphia*. *Mengia*, it is true, has but four outer falcal teeth, while *Drapetisca* has five; but in the latter case the first is small and abnormally near the base of the fang, so that it may be regarded as adventitious. The other four resemble those of *Mengia*, and are similarly placed. Nevertheless I separate the two genera on the strength of differences in the form of the maxillæ, which are more quadrate in *Drapetisca* and thickened on the inner margin.

Four is also the number of outer teeth in *affinis* Bl. and *nigricauda* Cb., but it is a mere numerical coincidence, for in this case it is the four characteristic of *Erigone* and its allies, of which the fourth is usually the largest, and certainly never the least as it is in *Mengia*. As a matter of fact *Tmeticus affinis* Bl. is undoubtedly congeneric with the spider hitherto generally known as *Gongylidium graminicola* Sund., while *nigricauda* Cb. only fails to be a *Gongylidium (sensu stricto)* by reason of the nature and disposition of the leg spines. Thus, oddly enough, *Tmeticus affinis*, which has furnished a name for the whole group, must be removed to a considerable distance from its quondam associates.

On account of the characteristic leg spines of *nigricauda* (two dorsal on each tibia; black, short and slightly curved)

I propose the new genus *Ostearius* to receive it. It stands very near indeed to *Gongylidium*.

The remaining species agree in having five teeth on the outer margin of the fang-groove. The first is situated a little within the first half, followed by three others equidistant or nearly so, gradually increasing in size. The fourth is therefore the largest, while the fifth is smallest of all, and its distance from the fourth is sometimes as much as double the interval between the rest. The inner teeth vary in number from three to five, and are usually very small. The normal armature of the legs is—two dorsal spines on each of the tibiæ, one on each of the genua, and a lateral spine on the front side of tibia i., but some genera are defective in this respect.

Oreonetides adipatus L.K. is the type of a little group which lies nearest to *Mengia*. The falcal teeth are quite conical, straight and broad-based. It is chiefly to the strong development of the copulatory organs that these spiders owe the position here assigned to them, but in general structure (*e.g.* the form of the labium) they are nearer to *Linyphia* than to *Tmeticus*.

By virtue of the development of the genitalia, *Macrargus rufus* Wid., follows next in order; but it is very likely that it may ultimately find a place elsewhere, for Tmeticine characters are more conspicuous than in some of the genera which follow. For instance it differs from all its neighbours in the size of the inner falcal teeth in the male. They are even larger than in *Tmeticus* and *Ostearius*, and may quite easily be distinguished by the naked eye if the falces are looked at laterally. The male also has a mamilliform tuber on the front of the falces, but it is not centrally situated as in *Tmeticus*.

Very near to *Oreonetides* in external appearance is *Leptorhoptrum*. There is however a conspicuous difference in the development of the copulatory organs, which are in this genus of the very simplest type. The most decisive character is the form and size of the labium. There is not much differentiation between the sexes except in the caput of *hardii* Bl.

Reprobus Cb. is the connecting link with *Hilaira* and *Coryphœus*. All three are included by M. Simon under *Hilaira*; but this arrangement can hardly be maintained. It may be granted at once that a falcal tuber or modification of the caput of the male is not in itself a generic character; but the structure of the oral apparatus may certainly acquire that value if it can be shown to be distinctive of a group mutually agreeing in other characters. Now *Hilaira* (as defined below) has the labium contracted below the middle after the manner of *Oreonetides*, though not so strongly; whereas in *Coryphœus* and the species *reprobus* there is no indentation of the margins below the reflexed tip—they are parallel *(Coryphœus)* or even divergent *(reprobus)*. As the diagnosis will show, this character in *Hilaira* is reinforced by the dentition of the falces, the shape of the cephalothorax, and the armature and proportions of the legs. *Coryphœus* differs in all these particulars, and *reprobus* in all but the armature of the legs.

Coryphœus stands between two groups each characterized by a distinctive arrangement of leg spines, agreeing entirely and universally with one of them, *Oedothorax*. I do not know of a single character in which it is demonstrably nearer to *Hilaira* than to *Oedothorax*. By general consent it is to be separated from the latter; therefore, *a fortiori*, it must be regarded as distinct from *Hilaira*. It might be urged that *Hilaira uncata* Cb. has only one spine on tibia iv.; but the lateral spine on tibia i. is not wanting, and the legs are the legs of *Hilaira*, not the long pale slender legs of *Coryphœus*.

The segregation of *reprobus* Cb. follows as a natural consequence. I propose to make it the type of a genus *Halorates*, which will most probably include the continental *dentichelis* Sim.

Rivalis Cb. has the leg armature of *Coryphœus*, but is, I think, generically distinct; for the falces and their dentition are alike in the two sexes, while the labium is broad, short, and distinctly contracted below the middle. Moreover in both sexes the inner teeth are needlelike, about half the size of

the outer teeth. These characters, together with the short legs and the general structure of the copulatory organs, exclude it from any genus with which I am familiar. There is a bare possibility that it may be congeneric with *Hillhousia desolans* Cb., as the female genitalia appear to be of similar type. *H. desolans* is unknown to me, but if the species *misera* Cb. be correctly associated with it (which I very much doubt), then certainly *rivalis* cannot be referred to *Hillhousia*. It therefore becomes necessary to establish a new genus for this species, which I now do under the name *Diplocentria*.

To this section in which the inner falcal teeth are five in number, belong (besides *Diplocentria* and *Coryphœus*) the two genera *Sintula* and *Gongylidiellum*, but in both genera these teeth are reduced to mere blunt granules. In *Oedothorax* they are long, slender, and uniformly four in number in both sexes.

As far as I know, only two of the species enumerated by Mr. Pickard-Cambridge in 1900 under *Sintula* can enter the genus as now defined—*cornigera* Bl., the type, and *fausta* Cb. The rest do not belong to this series at all, with the possible exception of *pygmæa* Cb. *Frederici* Cb. (which by favour of Dr. Jackson I have had an opportunity of examining) is certainly congeneric with *Microneta beata* Cb., etc. *Pholcommoides* Cb. is a *Syedra*, while *aëria* Cb., as the lateral spine on tibia i. indicates, is possibly a congener of *Hillhousia misera* Cb. The minute species *diluta* Cb. is evidently intermediate between *Microneta* and *Syedra*. From both it differs in the relative size of the eyes and their position. As in the former genus, the falces are slightly modified in the male and the number of fang-teeth reduced. I propose for it the new genus *Rhabdoria*. The remaining species when better known—the type specimens are all unique—will probably be found to form a group intermediate between the more typical *Microneta* and the section of that genus as at present constituted, of which *subtilis* Cb. is the type—a section which will certainly have to be separated from the true *Microneta*, from which its members differ in the form of the

cephalothorax and of the falces, in the length of the legs, and in the structure of the copulatory organs. In support of this opinion I propose for them the genus *Agyneta*, of which a diagnosis is given below.

Diagnoses of the Genera discussed above.

Centromerus Dahl.

Outer teeth of the fang-groove three, inner none. Maxillæ quadrate, apical margin gently convex, chitinous, black. Labium very short and broad, narrowed below the reflexed tip. Femur i. (at least) bearing a spine or spines. Paracymbium of male very large, more or less crescent-shaped, hollowed within; epigyne of female with transverse fovea, divided by a median process. Front middle eyes very small, close together, their laterals at least three times as large.

British species: *silvaticus* Bl., *expertus* Cb., *prudens* Cb., *arcanus* Cb., *emptus* Jackson, *serratus* Sim., *similis* Kulc., ?*commodus* Cb., ?*adeptus* Cb.

Sub-genus: Centromeria Strand.

Differs from true *Centromerus* in having a double series of spines under all the tibiæ, and several spines on metatarsus iv. Also all the dorsal spines of the tibiæ are of the same strength and character, not larger and stronger on the posterior legs as in true *Centromerus*; the falces are not granulate, nor the copulatory organs so much developed.

British species: *bicolor* Bl., *concinna* Thor.

Mengia F. Cb.

Outer fang-teeth four, equidistant, the fourth least; inner teeth three, rather longer than broad at the base, acute, equidistant. Maxillæ much longer than broad. Tibiæ all bearing spines on both sides and beneath. Metatarsi also spined; femora spineless.

British species: *scopigera* Grube, *warburtonii* Cb.

Oreonetides Strand.

Outer fang-teeth five, equidistant, increasing in size to the fourth, the fifth equal and similar to the first; inner teeth three, equidistant, the third largest, all conical, acute, as broad at the base as high. Labium much broader than long, narrowed below, not reaching the middle of the maxillæ, which are parallel-sided and slightly convergent. Two dorsal spines on all the tibiæ, one on the front side of tibia i. near the apex; femoral none, metatarsal none. Falces similar in male and female.

British species: *abnormis* Bl., *adipatus* L.K., *firmus* Cb., *contritus* Cb.

Macrargus Dahl.

Outer teeth as in *Oreonetides*, inner teeth three or four, small in the female, similar to the outer in the male and as large. Tumid base of the falces granulate, projecting far in front of the clypeus. Labium large, half the length of the maxillæ, reflexed almost from the base, where it is broadest. Upper middle eyes larger than the laterals, their interval half the lateral interval. Leg spines as in *Oreonetides*.

British species: *rufus* Wid.

Hilaira Sim.

Outer teeth five, the fifth much smaller than the others, darker, separated by a wider interval; inner teeth three, very small, almost granular, obtuse or subacute, first interval narrower than the second. Labium wider than long, widest in the middle (but not much wider than at the base), not reaching the middle of the maxillæ. Legs short and stout, spines as in *Oreonetides*. In the British species (*montigena* excepted) the tarsi and metatarsi of the first pair are equal.

British species: *excisa* Cb., *uncata* Cb., *pervicax* Hull, *montigena* L.K.

Leptorhoptrum Kulcz.

Outer teeth five, similar in the two sexes, the fifth less than the first, the interval between fourth and fifth greater than the

other intervals; inner teeth three, very small but acute. Labium large, reaching the middle of the maxillæ, as wide at the middle as at the base, only slightly narrowed between these two points, the reflexed part equal to half the whole length. Tibial and patellar joints of the male palpus more or less elongate, the tarsal joint small. Epigyne of the female exceedingly simple, without any special sculpture.

British species: *huthwaitii* Cb., *hardii* Bl.

Halorates gen. nov.

Outer teeth like those of *Hilaira*, but the fifth is rather larger; inner teeth similar to those of *Oreonetides*, but larger, being quite equal to the fifth of the outer series. The dentition is similar in the two sexes, but the male has a mamilliform tuber on the front of the falces. Labium widest at the base, reaching the middle of the maxillæ. Outer margin of the maxillæ straight. Leg spines as in *Oreonetides*.

British species: *reprobus* Cb. (type).

Sintula Sim.

Outer teeth five, subequal, equidistant; inner five, granular, obtuse; both series similar in the two sexes. Labium as in *Hilaira*. Maxillæ not converging beyond the labium. Legs fairly long; two dorsal spines on all the tibiæ, none lateral. Cephalothorax very broad, oval, narrowed to the lateral eyes without indentation. Sides of the caput vertical, the eyes occupying the whole width.

British species: *cornigera* Bl., *fausta* Cb.

Diplocentria gen. nov.

Outer teeth five, subequal, equidistant; inner teeth five, similar to the outer, but only about half as long; neither series modified in the male. Labium similar to that of *Oreonetides* on a smaller scale. Legs rather short; one dorsal spine only on tibia iv.; none lateral. Cephalothorax narrow, oval, slightly indented at the base of the maxillæ; eyes not occupying the whole width of the caput.

British species: *rivalis* Cb. (type).

Gongylidiellum Sim.

Teeth similar in the two sexes; outer five, the fourth much the longest, the first four very close together, the fifth small and remote: inner five, granular and very minute. Front eyes closely approximate. Legs short; anterior tarsi fusiform, equal in length to the metatarsi. Maxillæ much inclined inwards; labium small.

British species: *latebricola* Cb., *vivum* Cb., *paganum* Sim., *murcidum* Cb., *dolosum* Cb.

Coryphæus F. Cb.

Outer teeth as in *Oreonetides*, but not so strong, smaller and wider apart in the male; inner teeth five, obtuse or acute, small. Inner margins of the maxillæ subparallel beyond the labium; outer margins diverging widely towards the base. Labium large, reaching the middle of the maxillæ, widest at the base. Legs long; one dorsal spine only on tibia iv.; no lateral spines.

British species: *distinctus* Sim., *simplex* F. Cb., *fortunatus* Cb.

Oedothorax Bertk.

Outer teeth of the female as in the same sex of *Coryphæus* but broader at the base, in the male closer and more slender; inner teeth in both sexes four, fairly long, blunt, very close together. General characters of *Coryphæus*, but the cephalothorax of the male is subject to modification and the copulatory organs are of a different type.

British species: *fusca* Bl., *agrestis* Bl., *retusa* Westr., *apicata* Bl., *gibbosa* Bl., *tuberosa* Bl., *gibba* Cb., *mora* Cb.

Gongylidium Sim.

Outer teeth four or five in the female, in the male two contiguous at the inner extremity of the fang-groove; inner three in both sexes, similar to the outer. Falces not very tumid at the base, smooth. Legs long and slender, their armature as in *Oedothorax*.

British species: *rufipes* Sund.

Ostearius gen. nov.

Teeth as in *Gongylidium*, but one outer tooth only in the male. Two dorsal spines on all the tibiæ, short and black. Other characters of *Gongylidium*.

British species: *nigricauda* Cb. (type).

Tmeticus Menge.

Outer teeth four, very short and far apart in the male; inner teeth large. Maxillæ nearly rectangular in the upper half, very strongly inclined inwards. Labium not large, margins parallel below the reflexure. Falces very tumid at the base and granulate. Leg spines of *Gongylidium*.

British species: *affinis* Bl., *graminicola* Bl., *dentatus* Wid.

I append the formal diagnoses of the two new genera which I have proposed to separate from *Microneta* and *Sintula*.

Agyneta gen. nov.

Cephalothorax broad oval, thoracic part almost circular. Falces short, narrowed to the extremity on both sides. Fang unusually thick; groove deep, without marginal teeth. Eyes small, very closely grouped, not occupying the whole width of the caput. Legs shorter than in *Microneta*.

British species: *passiva* Cb. (type), *subtilis* Cb., *cauta* Cb., *decora* Cb., *clypeata* F. Cb.

Rhabdoria gen. nov.

Falces straight, longer than the facial height, not attenuate or divergent in the male. Outer teeth three in the female, two in the male; inner teeth none. Eyes closely grouped, the fore central pair small and dark, the rest larger, nearly white. Legs normal, two slender spines or bristles on each tibia; no lateral spines. Cephalothorax rather long, not much narrowed at the caput.

British species: *diluta* Cb. (type).

I have to thank the Rev. O. Pickard-Cambridge for the loan of type specimens of *Coryphœus fortunatus* Cb. and *Ostearius nigricauda* Cb., and Dr. Jackson for the loan of a male of *Microneta frederici* Cb. Mr. W. Falconer has sent me a female of *Maro minutus* Cb. since the above was written. I have not been able to examine it closely, but there seems to be no doubt that the genus *Maro* should stand next to *Gongylidiellum*. The general appearance is the same, and so is the form of the maxillæ and labium; but falces, eyes, legs, and copulatory organs all show marks of difference. The outer falcal teeth are exceedingly minute, the first four unusually distant from the base of the fang, and very close together. If the fifth exists I have not been able to see it; nor can I distinguish any inner teeth.

SYNONYMY.

[Abbreviations: Cb., 1900=List of British and Irish Spiders, Pickard-Cambridge, 1900.

Cb., P.D.F.C.=Pickard-Cambridge, Proceedings of the Dorset Nat. Hist. and Antiquarian Field Club.

Sim., A.F.=Simon, Arachnides de France, vol. v., parts 2 and 3, 1884].

Centromerus:

C. silvaticus Bl.=Tmeticus sylvaticus Bl.—Cb., 1900.
C. expertus Cb.=Tmeticus expertus Cb.—Cb., 1900.
C. prudens Cb.=Tmeticus prudens, Cb.—Cb., 1900.
C. arcanus Cb.=Tmeticus arcanus Cb.—Cb., 1900.
C. emptus Jackson=Centromerus emptus Jackson—Jackson, Proc. Chester Soc. of Nat. Sc., &c., 1907.
C. serratus Sim.=Tmeticus serratus Sim., A.F.
Sintula balteatus Sim. (♀ non ♂), A.F.
Tmeticus serratus Sim.—Cb., P.D.F.C., 1907.
C. similis Kulcz.=Centromerus similis Kulcz.—Cb., P.D.F.C., 1905.
C. (?) commodus Cb.=Tmeticus commodus Cb., P.D.F.C., 1905.
C. (?) adeptus Cb.=Tmeticus adeptus Cb., P.D.F.C., 1900.

Centromeria:

C. bicolor Bl.=Tmeticus bicolor Bl.—Cb., 1900.
C. concinna Thor.=Tmeticus concinnus Thor.—Cb., 1900.

Mengia :

M. scopigera Grübe=Tmeticus scopiger Grübe—Cb., 1900.

M. warburtonii Cb.=Tmeticus warburtonii Cb.—Cb., 1900.
Mengea warburtonii Cb.—Cb., P.D.F.C., 1909.

Oreonetides :

O. adipatus L.K.=Porrhomma adipatum L. Koch—Cb., 1900; Sim., A.F.

O. abnormis Bl.=Tmeticus abnormis Bl.—Cb., 1900.

O. firmus Cb.=Tmeticus firmus Cb.—Cb., P.D.F.C., 1905.

O. contritus Cb.=Tmeticus contritus Cb.—Cb., 1900.

Macrargus :

M. rufus Wid.=Tmeticus rufus Wid.—Cb., 1900.

Hilaira :

H. excisa Cb.=Hilaira excisa Cb.—Cb., 1900.

H. uncata Cb.=Hilaira uncata Cb.—Cb., 1900.

H. pervicax Hull=Hilaira pervicax Hull—J. E. Hull, Trans. Nat. Hist. Soc. Northd., &c., vol. iii, 1908.

H. montigena L. K.=Tmeticus montigena L. Koch—Cb., 1900.
Porrhomma montigena L. Koch—Sim., A.F.

Leptorhoptrum :

L. huthwaitii Cb.=Tmeticus huthwaitii Cb.—Cb., 1900; Sim., A.F.
Leptorhoptrum huthwaitii Cb.—Kulcz., Aran. Hung. ii.

L. hardii Bl.=Tmeticus hardii Bl.—Cb., 1900; Sim., A.F.

Halorates :

H. reprobus Cb.=Tmeticus reprobus Cb.—Cb., 1900.

Sintula :

S. cornigera Bl.=Sintula cornigera Bl.—Cb., 1900; Sim., A.F.

S. fausta Cb.=Sintula fausta Cb.—Cb., 1900.

Diplocentria :

D. rivalis Cb.=Tmeticus rivalis Cb.—Cb., P.D.F.C., 1905.
Centromerus subalpinus, de L. (♂ non ♀)—Rev. Suisse Zool., 1907.

Coryphæus :

C. distinctus Sim.=Gongylidium distinctum Sim.—Cb., 1900.

C. simplex F. Cb.=Tmeticus simplex F. Cb.—Cb., 1900.

C. fortunatus Cb.=Tmeticus fortunatus Cb.—Cb., 1900; P.D.F.C., 1907.
Oreoneta fortunata Cb.—Cb., P.D.F.C., 1909.

Oedothorax :

All the species enumerated under this genus are included in *Gongylidium* Cb., 1900, and Sim., A.F. Of *Gongylidium* the type is *rufipes* Sund., and as the present species are not congeneric with *rufipes*, Simon (Hist. Nat. des Araignées, 1894), following Kulczynski (Aran. Hung.), adopted for this group Blackwall's name *Neriene*. As originally propounded in 1833, *Neriene* consisted of *marginata* Bl. (= *Linyphia clathrata* Sund.), *rubens* Bl., and *cornuta* Bl., and no type was indicated. In 1868 Menge (Preuss. Spinn., vol. ii.) made *rubens* Bl. the type of his *Gonatium*—a genus still maintained—under the name of *Gonatium cheliferum* Menge. *Cornuta* Bl. was thus left as the type of *Neriene*, and the genus before us must take the name *Oedothorax* (Bertkau, Beitr. z. Kennt. Spinn. f. Rheinp., 1883), the type being *gibbosa* Bl.

Gongylidium :

G. rufipes Sund. =Gongylidium rufipes Sund.—Cb., 1900.

Ostearius :

O. nigricauda Cb. =Tmeticus nigricauda Cb. - Cb., P.D.F.C., 1907.

Tmeticus :

T. affinis Bl. =Tmeticus affinis Bl.—Cb., 1900.

T. graminicola Bl. =Gongylidium graminicola Bl.—Cb., 1900.

T. dentatus Wid. =Gongylidium dentatum Wid.—Cb., 1900.

Gongylidiellum :

All the species enumerated are included in the same genus Cb., 1900.

Agyneta :

All the species enumerated are recorded by Mr. Pickard-Cambridge as *Micronetæ*.

Rhabdoria :

R. diluta Cb. =Sintula diluta Cb.—Cb., 1900.

The original types of *Hilaira uncata*, *H. pervicax*, *Oreonetides abnormis*, *O. contritus*, *O. firmus* ♂, *Centromerus prudens*, *C. arcanus*, *Sintula fausta* ♀, and *Coryphœus distinctus* ♀ were all Northumbrian; while *Oreonetides adipatus* was discovered in the Tyrol and on Cheviot Hill almost simultaneously. *Hilaira pervicax* and *Oreonetides contritus* still remain peculiar to the county, and several others are more abundant here than elsewhere, according to our present knowledge—notably *Diplocentria rivalis*, *Sintula fausta*, and

Oreonetides firmus. Northumberland is therefore very closely connected with the history of these spiders, and may legitimately be regarded as their British headquarters.

II.

Some Northern Records for 1909.

By far the most interesting spiders which have passed through my hands in 1909 were captured in Cleveland and sent to me by my nephew, Mr. J. W. H. Harrison of Middlesbrough. These included two species new to the British list, and another which may prove to be a new species. Besides these, I have received from him close upon 200 species from Cleveland, and upwards of 100 species from Durham county. To the Durham list also belongs an interesting little collection received from Mr. W. L. Turner of the Derwent Valley Field Club. I have myself had little opportunity for collecting, and my rather tame records represent a brief visit to the Galloway coast in June, and a similar excursion to the Northumbrian coast in September. The latter expedition was undertaken in the hope of picking up the unknown female of *Cnephalocotes incurvatus* Cb., but it did not turn up. I give the more noteworthy records under territorial heads.

CLEVELAND (Mr. Harrison).

Lephthyphantes nebulosus Sund. Plentiful under stones on the coast.

Lephthyphantes tenebricola Wid. Both sexes.

Hillhousia misera Cb. Adult males.

Bathyphantes approximatus Cb. Adult female, January, 1910.

Centromerus expertus Cb. Both sexes.

Notioscopus sarcinatus Cb. Adult males in June; adult females from March to October. First British record. Previously recorded only for Central Europe and the middle of France. The female is now figured for the first time. Taken on Eston Moor from sphagnum in ditches.

Hypselistes florens Cb. *(Teste auctore).* Swampy places on old jet-workings on Eston Moor, one adult male and two adult females in June. First British record. Previously known only in the temperate region of the United States, where it appears to be fairly common, along with other members of the same genus. Whether one of these is identical with our British *Hypselistes (Entelecara) jacksonii* Cb. remains to be seen. No representative of the genus has yet been taken on the continent of Europe.

DURHAM COUNTY.

(1) Derwent Valley (Mr. Turner).

Chiracanthium lapidicolens Sim. Adult female, Axwell Park.

Pachygnatha listeri Sund. Adult male, Axwell Park.

Cyclosa conica Pallas. Immature male, Axwell Park.

(2) Team Valley (Mr. Harrison).

The following species were taken in the neighbourhood of Birtley in December, 1909.

Amaurobius ferox Walck. Adult female.

Maso sundevallii Westr. Adult females.

Troxochrus scabriculus Cb. Males and females, adult.

Evansia merens Cb. Adult male.

Ceratinella brevipes Westr. Adult females.

NORTHUMBRIAN COAST (J. E. H.) Near Newbiggin, September, 1909.

Agroeca proxima Cb. Both sexes.

Erigone longipalpis Sund. Both sexes, abundant.

Erigone arctica White. Two females.

Troxochrus scabriculus Cb. Both sexes.

Troxochrus cirrifrons Cb. Males, with the preceding.

Evansia merens Cb. Both sexes; in nests of *Lasius niger*.

Xysticus erraticus Bl. Both sexes.

Oxyptila atomaria Panz. Both sexes.

DUMFRIES AND KIRKCUDBRIGHT (J. E. H.)

Clubiona brevipes Bl. Adult male, Collin.

Clubiona grisea L. K. Both sexes, Clarencefield.

Cryphoeca silvicola var. *carpathica* Herm. An adult female, Auchencairn. Rather larger than typical *silvicola* C. L. K., and the legs are pale, almost concolorous. The epigyne answers exactly to Kulczynski's figure (Aran. Hung., ii., Tab. vi., fig. 29a).

Enoplognatha thoracica Hahn. Both sexes, Rascarrel. Under stones on the shore.

Asagena phalerata Panz. Adult female, Rascarrel.

Hillhousia misera Cb. Adult females, Collin.

Microneta saxatilis Bl. Adult females, Collin.

Microneta conigera Cb. Adult females, Collin.

Microneta cauta Cb. Adult females, Collin.

Sintula fausta Cb. An adult male, Collin.

Erigone arctica White. Adult females, Rascarrel.

Metopobactrus prominulus Cb. Adult female, Rascarrel.

Cnephalocotes elegans Cb. Adult females, swarming under sea-weed in Auchencairn Bay.

Cnephalocotes curtus Sim. A single adult female, Rascarrel. Under dry sea-weed on the beach.

Evansia merens Cb. Adult female, Solway Banks, close to high-water mark; no ants' nests anywhere near.

Oxyptila atomaria Panz. Collin; Auchencairn; Rascarrel.

Pirata piscatorius Clerck. Adult female, Collin.

Pirata latitans Bl. Both sexes, near Dalbeattie.

Lycosa arenicola Cb. Adult females, Rascarrel.

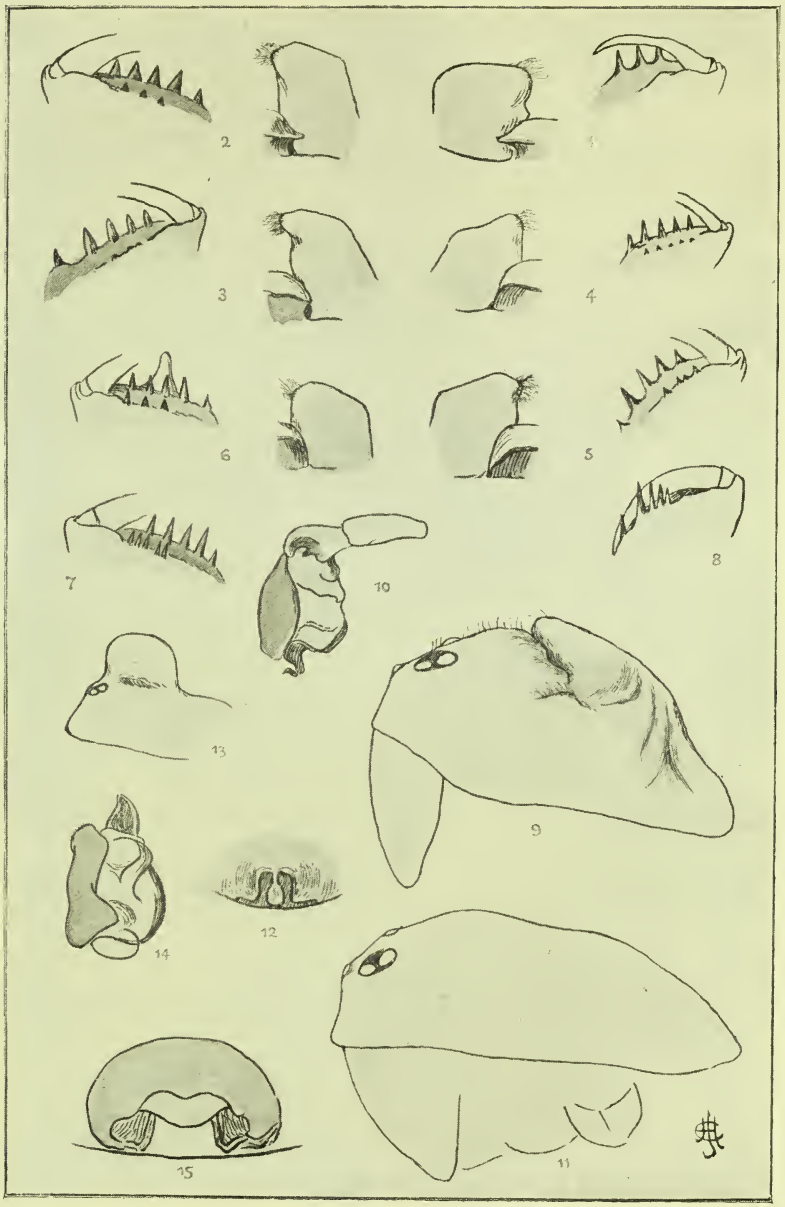
Lycosa monticola Sund. Adult females, Rascarrel.

Heliophanus cupreus Walck. Adult females, Rascarrel.

Euophrys frontalis Walck. Both sexes, Rascarrel; abundant under stones on the beach. The females were spun up with their eggs.

REFERENCES TO PLATE XV.

1. *Centromerus*, teeth, maxilla, labium.
2. *Oreonetides*, ,, ,,
3. *Hilaira*, ,, ,,
4. *Coryphæus*, ,, ,,
5. *Macrargus* ♀, ,, ,,
6. *Halorates* ♂, ,, ,,
7. *Diplocentria*, teeth.
8. *Gongylidiellum*, external teeth.
9. *Notioscopus sarcinatus* ♂, cephalothorax.
10. ,, ,, ♂, left palpus, outside.
11. ,, ,, ♀, cephalothorax.
12. ,, ,, ♀, epigyne.
13. *Hypselistes florens* ♂, caput, side view.
14. ,, ,, ♂, left palpus, above.
15. ,, ,, ♀, epigyne.



Two Spiders new to Britain; with Oral Details of certain Genera to illustrate a proposed subdivision of Tmeticus (Sim., 1894; Cb., 1900).

THE FAUNAL SUCCESSION OF THE UPPER BERNICIAN

By Stanley Smith, M.Sc., F.G.S.

(Plates xvi., xvii., xviii.)

CONTENTS.

I. Introduction.
II. The Bernician Series.
III. Physical Conditions prevailing during the deposition of the Series.
IV. Stratigraphical Subdivisions.
V. Faunal Succession, and comparison of the same with that of the South-West Province.
VI. The Bernician Limestones, their geographical distribution, stratigraphical characters and faunal contents.
VII. Description of certain Corals and Brachiopods.
VIII. Exposures.

I.

INTRODUCTION.

In this paper are set forth the results obtained by collecting in the calcareous beds of the Bernician or Lower Carboniferous series of Northumberland. The work, which occupied the greater part of a year (1907–8), had for its object an inquiry into the faunal succession of the Upper Bernician.

The scheme adopted for zoning was that used by Dr. Arthur Vaughan in his work on the Carboniferous Limestone formation of the South-West Province, and successfully applied by subsequent workers to other Carboniferous areas in Britain.

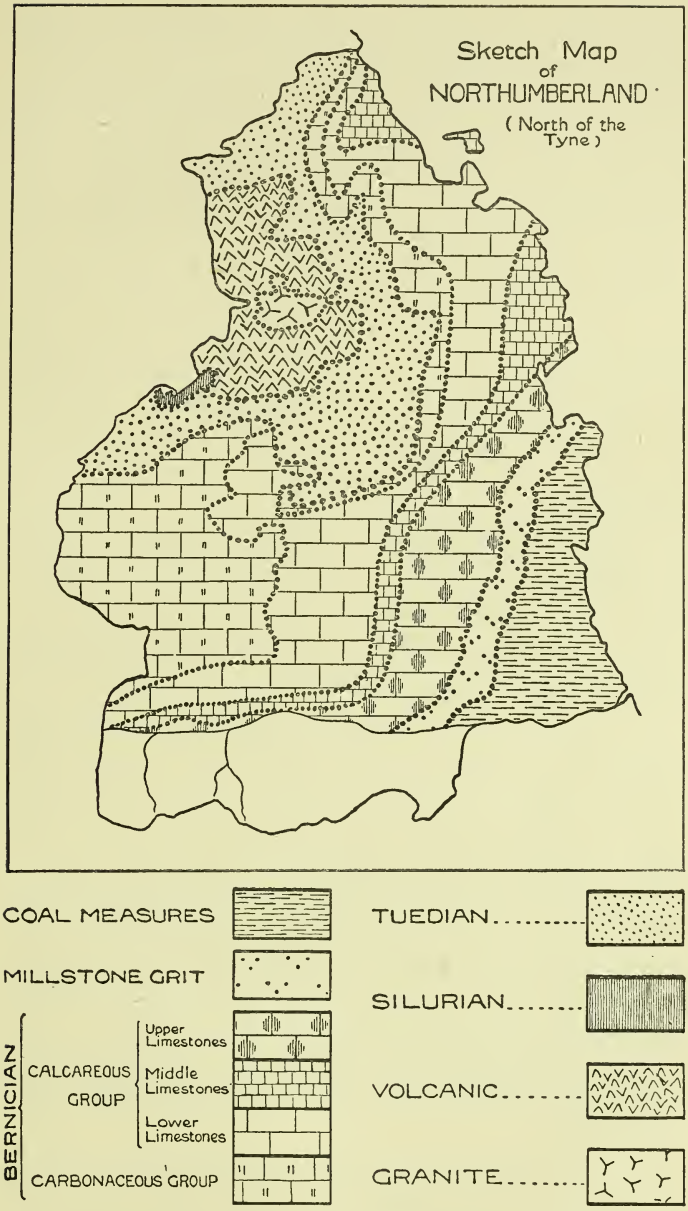
I take this opportunity of thanking those gentlemen who have so generously aided me in my undertaking. I am especially indebted to Prof. G. A. Lebour and Dr. Vaughan, to Prof. Lebour for his advice and encouragement whilst carrying out the field-work, and to Dr. Vaughan for determining the corals and for other valuable assistance. My thanks are also due to Dr. Wheelton Hind for naming the lamellibranchs, and to several members of H.M. Geological Survey, namely to Dr. Traquair for identifying the fish remains, to Dr. Kitchin and to Mr. R. G. Carruthers. Lastly I must express my great obligation to Mr. John Dunn, formerly of Redesdale, for allowing me access to his valuable collection of Redesdale fossils—the result of many years' careful collecting.

II.

THE BERNICIAN SERIES.

The Bernician series forms the upper, and by far the larger, division of the Lower Carboniferous sequence of Northumberland, and covers the greater part of the county. It is divisible into two groups, the upper or Calcareous Division and the lower or Carbonaceous Division. Below the Bernician strata lie the Tuedian beds, including under the term the Fell Sandstone series and the Cementstone group. The Northumberland succession, together with the Lower Carboniferous rocks north of the Tweed, occupies the northern extremity of the Carboniferous Limestone tract, which stretches from Lancashire and Yorkshire into Scotland.

The Carboniferous strata in Northumberland encircle the Cheviots on the south, east, and north, and dip from the volcanic inlier, so that the general strike forms a rough semicircle round the igneous massif, nearest to which consequently lie the lowest beds. (See map.) In the south and east, the strata may be followed as continuous outcrops. In the districts round the volcanic inlier faulting has entirely destroyed the continuity of strike, but in the north it has spread out the scattered and repeated outcrops into belts, which run in the same direction as the general strike.



Geological Sketch-Map of Northumberland to show the Distribution of the Bernician Limestones.

The thickness of the Carboniferous Limestone series in Northumberland is difficult to estimate on account of excessive faulting and also owing to the great variations in thickness displayed by different members. It is probable that one division increases locally at the expense of another. The following figures given by members of H.M. Survey and others afford some idea regarding the thicknesses and variations of the groups; but they are only approximate.

	Tyne & Rede.	Coquet.	Tweed.
Bernician.			
Calcareous Division ...	4000?	?	1700
Carbonaceous Division ...	2500	Thin.	900
Tuedian.			
Fell Sandstone Series ...	600	2000	600
Cementstone Group ...	600	1000	2500

Between the Coquet and the Tweed the Cementstone group thins out locally to a few hundred feet (300 or 400?).

The Bernician series is mainly built up of shales and sandstones, but interbedded among the argillaceous and arenaceous deposits are beds of limestone and coal. Calcareous horizons are found in both divisions of the series, but the beds in the upper contrast strongly with those of the lower. In the Calcareous Division the limestones are thick, truly marine, and constant, some of them traversing the whole length of the county. In the Carbonaceous they are thin and impure, and often contain rootlets of Stigmaria; a few marine limestones make their appearance in the south. It is with the upper limestones that this paper is solely concerned, and my investigations were restricted to the country north of the Tyne.

South of Northumberland the Upper Bernician is mainly represented by the Yoredale rocks; the basal limestones, together with the Carbonaceous Division, are equivalent to

the Great Scar Limestone series. The higher Yoredale strata disappear as they are followed southward; till in Wharfedale the Millstone Grit comes almost immediately upon the Main (= Great) Limestone.

III.

PHYSICAL CONDITIONS PREVAILING DURING THE DEPOSITION OF THE SERIES.

This series of thick detrital accumulations, containing numerous beds of coal and frequent interpolations of calcareous strata, could only have been formed in the proximity of land, and under very varying conditions, involving continuous oscillation of the sea floor and repeated change in geographical relationships. The rate of accumulation of sediment must at one period have exceeded the rate of subsidence, so that the sea became so silted up as to form a swamp in which grew the jungles that formed the coal seams. Rapid submergence followed, and these vegetable accumulations often became the floor upon which the calcareous deposits were laid down. The limestones were deposited near enough to the coast to allow frequent invasions of fine sediment, as indicated by the numerous shaly partings and interbedded shales.

IV.

STRATIGRAPHICAL SUBDIVISIONS.

The limestones of the Calcareous Division may be divided into three groups. The limestones above the Little Limestone, which occupy the south and east of Northumberland and which thin out towards the north, form the Upper Group; the Middle Group comprehends those thick and continuous beds which can be followed right across the county, and includes the Great Limestone; whilst to the Lower Group belong the limestones of the Calcareous Division below the Eelwell Limestone.

Table I.

THE PRINCIPAL LIMESTONES OF THE UPPER BERNICIAN OR CALCAREOUS DIVISION.

	Tyne District.	Alnwick District.	Lowick and Scremerston District.
UPPER GROUP.	Fell Top Limestone. *Robsheugh Limestone. *Thornbrough Limestone. *Corbridge Limestone.	Fell Top Limestone (Alnmouth)	
MIDDLE GROUP.	Little Limestone. Great Limestone. Four Fathom Limestone. Three Yards Limestone. Five Yards Limestone. Scar Limestone.	Great Limestone. Eight Yards Limestone. ? Six Yards Limestone. ? Nine Yards Limestone.	Great or Dryburn Limestone. Lowdean Limestone. Acre Limestone. Eelwell Limestone.
LOWER GROUP.	Cockle Shell Limestone. Single Post Limestone. Tyne Bottom Limestone. Number of thin limestones. Fourlaws Limestone. Redesdale Limestone. Redesdale Ironstone Shale.	Hobberlaw Limestone. Dun Limestone.	Oxford Limestone. Woodend Limestone. Dun Limestone.

Besides the beds enumerated above are many thin calcareous horizons and local beds of considerable thickness.
* "Intercalated Limestones" of Professor Lebour.

V.

FAUNAL SUCCESSION, AND COMPARISON OF THE SAME WITH THAT OF THE SOUTH-WEST PROVINCE.

The fauna throughout the Calcareous Group closely agrees with the fauna of the Dibunophyllum-Zone, the highest of the palæontological divisions into which the Carboniferous Limestone series of the South-West Province (Bristol area) has been divided by Dr. Vaughan.*

The Bernician sequence yields a faunal succession which is capable of being divided into several marked horizons by means of corals and brachiopods, whilst a number of these horizons can be grouped together as characterised by the presence or abundance of some particular form or forms.

* A. Vaughan, "The Carboniferous Limestone Series of the Avon Gorge." Proc. Bristol Nat. Soc., 1906, ser. 4, vol. i, pt. ii, p. 74.

(See Table 2, p. 598).

Table 2.

PALÆONTOLOGICAL HORIZONS OF THE UPPER BERNICIAN.

Dy	Fell Top Limestone	IVc	Horizon of Dibunophyllum aff. muirheadi mut. cf. Dib. ψ	Dibunophyllum muriheadi	Diphyphyllum	Productus β	Saccammina carteri
	Robsheugh Limestone Thornbrough Limestone Corbridge Limestone	IVb	Decadent and impoverished IVa Fauna				
	Little Limestone Great Limestone	IVa	Maximum of the Clisiophyllids				
D2–3	Four Fathom Limestone Acre Limestone Eelwell Limestone	III	Zaphrentid Phase				
D2	Oxford Limestone	II.	Lower D2 Fauna Lonsdaleia floriformis enters		Lithostrotion irregulare	Productus α	
D1	Fourlaws Limestone Redesdale Limestone	I	D1 Fauna				
	Redesdale Ironstone Shale	a	Shallow Water Phase				

Faunal Diagnoses*.

a.—Shallow water fauna, mainly lamellibranchs and certain brachiopods. Corals extremely rare, but *Dibunophyllum θ* has been found. The bed corresponds, approximately at least, in position to the concretionary beds immediately below D1 of the South-West Province.

I.—(D1).

Cyathophyllum murchisoni Ed. and H. very common.

Campophyllum derbiense.

Diphyphyllum subibicinum (M'Coy).

Carcinophyllum θ Vaughan.

Dibunophyllum θ Vaughan.

Clisiophylloid *Lithostrotion.*

Lithostrotion irregulare, as well as *Lith. junceum* and *Lith. portlocki* abundant, but as yet of no value in subdividing the D zone.

The fauna is comparable with that of D1 in the South-West Province.

II.—(D2).

II. contains forms found in D2 of the South-West Province.

Lonsdaleia floriformis, Flem.

Dibunophyllum ϕ, Vaughan, and variants.

Lithostrotion irregulare and *Lith. junceum.*

III.—(D2-3).

Representing in its main character a Zaphrentid phase.

Caninoid *Campophyllum.*

Zaphrentis near *enniskilleni*, E. and H.

* I am indebted for this portion of the paper to Dr. Vaughan, having embodied here his report on the corals submitted to him for examination. What slight alterations have been made were necessitated by the results obtained in subsequent investigations.

Caninia cf. *cornucopiæ*, Nich.

Zaphrentis near *oystermouthensis*, Vaughan.

Zaphrentis constricta, Carruthers.

All the species above cited, with the exception of the last, are common in the D2–3 Beds of Gower, South-West Province. Associated with the above are a few representatives of standard conditions D2 and Dy: *Clisiophyllum* nr. *subimbricatum*, Thom.; *Koninckophyllum magnificum*, Thom. and Nich.; *Diphyphyllum lateseptatum*, M'Coy, and small variant.

IVa.—(Dy).

The main fauna represents standard conditions, and is extremely rich.

Dibunophyllum muirheadi, Thom. and Nich., and var. *D. splendens*. *Dibunophyllum* ϕ Vaughan and variants.

Koninckophyllum magnificum, Thom. and Nich., and numerous variants, including Dibunophylloid and Diphyphylloid varieties, *e.g.*, *Diphyphyllum dianthoides* (M'Coy) and *Koninckophyllum* near *interruptum*, Thom. and Nich.

Diphyphyllum subibicinum, *D. lateseptatum*, and *D. concinnum*.

Lonsdaleia duplicata, Phill., and massive variant *L. conaxis*, M'Coy.

Also *Cyclophyllum* aff. *pachyendothecum*, Thom., which does not as yet possess any great value except as an index of D. (Some forms referred to *Aulophyllum* by Thomson are merely the young stages of the species cited above).

The fauna appears to represent a somewhat higher coral development than is found in the D2 subzone of *Lonsdaleia floriformis* of the South-West Province, and consequently the beds are probably higher than the uppermost limestone of that area. Whenever both *Lonsdaleia floriformis* and *Lonsdaleia duplicata* are found, their maxima occur in the order above stated. In the S.W. Province the only massive *Lonsdaleia* is

L. floriformis. In Northumberland this species is rare, but *L. duplicata*, var. *conaxis*, is common.

The branching out into numerous variants, which both *Dibunophyllum* and *Koninckophyllum* exhibit, illustrates the instability which frequently precedes extinction.

Diphyphyllum reaches its acme of development in *D. dianthoides*, which is only foreshadowed in the D2 of the South-West Province.

On the other hand one of the variants of *Koninckophyllum* is less highly developed than the D2 species of the South-West Province, and is but little advanced on the D1 form. Also *Cyclophyllum* aff. *pachyendothecum* is not much more advanced than the form in D1.

The rich coral fauna which reaches its maximun development in IVa is represented by exaggerated and decadent forms in IVb and IVc.

IVb.—(Dy).

The tendency in the Dibunophyllids towards Aspidophylloid structure, already marked in IVa, reaches its highest development in the *Aspidophyllum* of the Thornbrough Limestone. *Dibunophyllum muirheadi* (typical) is, nevertheless, abundant in this limestone.* A new genus of Cyathophylloid *Dibunophyllum*, which occurs in the Robsheugh Limestone, shows convergence with *Caninia* cf. *cornucopiæ* and *Densiphyllum* in the regularly spaced interseptal intersections in the large medial area.

IVc.—(Dy).

The index of IVc is *Dibunophyllum muirheadi* (mut. cf. *Dib.* ψ). The genus *Koninckophyllum* is represented by a loose-structured, irregular and decadent form. The *Cyathophyllum* characteristic of the horizon has the vaulted vesicular tabulæ of *Cyathophyllum regium*, but exhibits reversion in the fact that the tabulæ are only partially replaced by vesicles.

* In Thornbrough Quarry, Corbridge.

This phenomenon is to some extent exhibited in certain specimens of the simple form of *Cyath. regium* from D2 of the Avonian. The reduction in size and the conical form of the simple coral is an intimation of approaching inimical conditions.

The IVb and IVc fauna is probably the moribund representative of the Avonian coral fauna which reaches its acme in IVa.

The following correlation of the Bernician with the Dibunophyllum Zone of the South-West Province seems the most probable :—

Northumberland	South-West Province
Millstone Grit.	Millstone Grit.
Dy { IVc. / IVb. / IVa.	
III.	D2-3.
II.	D2.
I.	D1.
a.	Concretionary beds at top of S2?

N.B.—No attempt has been made in the above table to indicate the relative thickness of the various horizons.

VI.

THE BERNICIAN LIMESTONES, THEIR GEOGRAPHICAL DISTRIBUTION, STRATIGRAPHICAL CHARACTERS AND FAUNAL CONTENTS.

The Redesdale Ironstone Shale, Redesdale Limestone and Fourlaws Limestone.

Geographical Distribution.

These limestones are the most northerly of those running parallel to the Tyne. They cross the North Tyne south of

Wark and turn northwards. Their course being checked by a fault west of Sweethope Lough, they and their associated beds occur as faulted outliers among the Carbonaceous strata to the northward.

Redesdale Ironstone Shale.

Redesdale.

Stratigraphical Character.

Thickness about 30 feet. This shale is separated from the Redesdale Limestone by a thin but variable layer of black shale (1–2 feet) and a thin bed of sandstone, about 5 feet. The Ironstone Shale consists of a black argillaceous deposit with numerous bands of ironstone nodules and a layer of clay ironstone (4–6 inches).

Faunal Diagnosis.

CORALS:—Corals exceedingly rare, except *Alveolites*.

BRACHIOPODS:—*Productus undatus* and *Lingula scotica* characteristic forms. *P. concinnus* and *Orbiculoidea nitida* very abundant.

LAMELLIBRANCHS:—This class is represented by a large number of species; the most plentiful forms being *Schizodus axiniformis* and *Nucula gibbosa*.

Faunal List:—

Dibunophyllum near θ, Vaughan.
Fistulipora incrustans, Nich. and Foord.
Alveolites.
Ceriopora interporosa (Phill.)
Heterotrypa tumida (Phill.)
Fenestella.
Seminula ambigua (Sow.)
Dielasma gillingensis (Dav.)
Spiriferina cf. laminosa (M'Coy.)
Martinia glabra (Mart.)
Reticularia lineata (Dav.)
Pugnax pleurodon β (Phill.) and young forms of P. pleurodon.
Orthid.
Orthotetid.
Leptæna analoga (Phill.) var. distorta (Sow.)
Productus corrugatus, M'Coy.
Productus corrugato-hemisphericus
Productus antiquatus, Sow.
Productus pugilis, Phill.

Faunal List (continued).

Productus concinnus, Sow.
Productus scabriculus (Mart.)=P. cf. quincuncialis, Phill.
Productus punctatus (Mart.)
Productus undatus, Defr.
Chonetes volvâ, M'Coy.
Chonetes cf. crassistria, M'Coy.
Lingula mytiloides (Sow.)
Lingula squamiformis (Phill.)
Lingula scotica (Dav.)
Orbiculoidea nitida (Phill.)
Limatulina desquamata (M'Coy.)
Pterinopecten granosus (Sow.)
Aviculopecten semicostatus (Portl.)
Aviculopecten incrassatus (M'Coy.)
Pseudamusium redesdalense, Hind.
Actinopteria persulcata (M'Coy.)
Pinna mutica (M'Coy.)
Posidoniella elongata (Phill.)
Myalina pernoides (Portl.)
Myalina redesdalensis, Hind.
Myalina verneuillii (M'Coy.)
Nucula gibbosa (Flem.)
Nucula undulata, Phill.
Ctenodonta lævirostris (Portl.)
Nuculana attenuata (Flem.)
Nuculana brevirostris (Phill.)
Schizodus axiniformis (Phill.)
Protoschizodus axiniformis (Portl.)
Protoschizodus fragilis (M'Coy.)
Cardiomorpha parva, Hind.
Edmondia arcuata (Phill.)
Edmondia pentonensis, Hind.
Edmondia rudis, M'Coy.
Edmondia sulcata (Phill.)
Sedgwickia ovata, Hind.
Sanguinolites clavatus (M'Coy)
Sanguinolites plicatus (Portl.)
Sanguinolites striatogranulosus, Hind.
Sanguinolites tricostatus (Portl.)
Sanguinolites variabilis (M'Coy.)
Sanguinolites V-scriptus, Hind.
Sanguinolites visetensis, de Kon.
Allorisma sulcata (Flem.)
Allorisma variabilis, Hind.
Conocardium aliforme (Sow.)
Bellerophon decussata (Flem.)
Bellerophon urei (Flem.)
Loxonema murchisoniana, de Kon.
Loxonema scalaroidea, Phill.
Macrocheilina imbricata, Sow.
Naticopsis acuta, Sow.
Conularia quadrisulcata, Sow.
Orthoceras annulatum, Sow.
Orthoceras attenuatum (Flem.)
Orthoceras cylindraceum (Flem.)
Cyrtoceras rugosum (Flem.)
Glyphioceras diadema (Goldf.)
Glyphioceras truncatum (Phill.)
Stroboceras sulcatum (Sow.)
Archæocidaris urei (Flem.)
Lepidodiscus lebourii ?, Sladen.
Taxocrinus nobilis (Phill.)
Several other crinoids.
Dithyocaris dunni, Scoulen.
Dithyocaris glaber, Jones and Woodward
Dithyocaris tricornis, Woodward and Etheridge.
Teeth and scales of fish including:–
Gyracanthus.
Psammodus.
Chomatodus, etc.

NOTES:—Mr. John Dunn, who collected in the shale for upwards of twenty years, found a single specimen of a simple coral, namely *Dibunophyllum*. The structure is not wholly preserved, nevertheless Dr. Vaughan has determined the species as *Dibunophyllum* near θ but showing variation towards *Dib.* ϕ.

Productus scabriculus Mart. (*quincuncialis*, Phill.) common. A mutation of the genus *P.* aff. *scabriculus* intermediate between C and D forms and converging towards *P. corrugato-hemisphericus*,* is also plentiful and characteristic of the shale. *Lingula scotica*, a large triangular species with fine laminose concentric lines of growth, is not only restricted to this horizon but has not yet been reported from any other locality in England.

More genera and species of lamellibranchs have been obtained from this bed than from the rest of the Bernician series. The Pteropod *Conularia quadrisulcata* is common at Bellingham, but true gasteropods are not very plentiful.

Redesdale Limestone.

Stratigraphical Character.

Thickness 17 feet (at Redesdale). The upper 6 or 7 feet are argillaceously inclined, otherwise the limestone is massive.

Faunal Diagnosis.

CORALS:—The corals are mainly typical of D1, but contain forms belonging to D2. *Dibunophyllum* θ, *Carcinophyllum* θ, *Cyathophyllum murchisoni*, *Diphyphyllum subibicinum* and Clisiophylloid *Lithostrotion* (all D1 forms), common and highly characteristic. *Lithostrotion* (D2), very abundant.

BRACHIOPODS:—Giganteid *Producti* (*Prod.* α) exceedingly numerous, otherwise the number of brachiopods is very much less than in the limestone above.

* Dr. A. Vaughan.

Faunal List:—

Dibunophyllum θ, Vaughan.
Dibunophyllum ϕ, Vaughan (Di form.)*
Carcinophyllum θ, Vaughan.
Cyathophyllum murchisoni, Ed. and H.
Diphyphyllum subibicinum (M'Coy)
Campophyllum murchisoni, Ed. and H.*
Clisiophylloid Lithostrotion.
Lithostrotion irregulare (Flem.)
Lithostrotion junceum (Flem.)
Lithostrotion portlocki (Brom.) large and small varieties, also a Lonsdaloid mutation.
Zaphrentis sp.
Alveolites.
Athyris royssii (L'Eveillé.)
Dielasma sacculus (Mart.)
Dielasma vesicularis (de Kon.)
Reticularia lineata (Mart.)
Leptæna analoga (Phill.), var. distorta (Sow.)
Giganteid Producti—Productus α and varieties.
Productus corrugatus, M'Coy.
Productus longispinus, Sow.
Productus punctatus (Mart.)
Productus spinulosus, Sow.
Pinna flabelliformis, Mart.
Leveillia puzo, L'Eveillé.
Naticopsis plicistria (Phill.)
Naticopsis variata (Phill.)
Platyschisma helicoides (J. de C. Sow.)

NOTES:—*Lithostrotion junceum* is not only most prolific in its growth but it is exceptionally well developed. The corallites are very long and very straight.

I obtained most of the corals in the above list from two small quarries at Birtley. *Dibunophyllum* ϕ and *Campophyllum murchisoni* (marked by an asterisk) were found in the bed of a burn near Elsdon, and some doubt exists as to the limestone from which they have been derived being the Redesdale Limestone. Both specimens are in Mr. Dunn's collection.

Fourlaws Limestone.

Stratigraphical Character.

A dark-coloured compact limestone of at least 10 feet in thickness.

Faunal Diagnosis.

CORALS:—Not very plentiful.

BRACHIOPODS:—The Productids are represented by a large number of species, including *P. mesolobus* and *P. spinulosus*. *Productus* α exceedingly abundant. Papilionaceous *Chonetes* occur.

Faunal List:—

Cyclophyllum aff. pachyendothecum Thom.
Campophyllum aff. murchisoni, Ed. and H.
Lithostrotion irregulare (Phill.)
Lithostrotion junceum (Flem.)
Lithostrotion portlocki (Bronn)
Alveolites.
Heterophyllia sp.
Hyalostelia smithii, Young.
Athyris planosulcata (Phill.)
Seminula ambigua, Sow.
Dielasma gillingensis (Dav.)
Dielasma vesicularis (de Kon.)
Spirifer trigonalis (Mart.)
Spirifer planicosta, M'Coy.
Martinia glabra (Mart.)
Reticularia lineata (Mart.)
Reticularia ovalis (Phill.)
Pugnax pleurodon (Phill.)
Leptæna analoga (Phill.) var. distorta (Sow.)
Orthotetes, including some very large forms and O. radialis (Phill.)
Giganteid Producti - Productus α and variants.
Productus latissimus, Sow.
Productus corrugatus, M'Coy.
Productus antiquatus (Mart.)
Productus pugilis, Phill.
Productus concinnus, Sow.
Productus sulcatus, Sow.
Productus longispinus, var. sinuatus, de Kon.
Productus scabriculus (Mart.)
Productus punctatus (Mart)
Productus fimbriatus, Sow.
Productus aculeatus (Mart.)
Productus spinulosus, Sow.
Productus mesolobus, Phill.
Chonetes buchiana, de Kon.
Chonetes volva, M'Coy.
Papilionaceous Chonetes.
Lingula squamiformis (Phill.)
Aviculopecten dissimilis (Flem)
Palæolima obliquiradiata, Hind.
Pinna flabelliformis, Martin.
Modolia jenkinsoni (M'Coy.)
Grammatodon reticulatus (M'Coy.)
Grammatodon bistriatus (Portl.)
Cardiomorpha oblonga (Sow.)
Edmondia arcuata (Phill.)
Edmondia lowickensis, Hind.
Edmondia maccoyi, Hind.
Edmondia oblonga, M'Coy.
Edmondia rudis, M'Coy.
Edmondia sulcata (Phill.)
Edmondia unioniformis (Phill.)
Sanguinolites tricostatus (Portl.)
Sanguinolites variabilis (M'Coy.)
Allorisma sulcata (Flem.)
Allorisma variabilis, Hind.
Solenomya costellata, Phill.
Solenomya primæva, M'Coy.
Clinopistha abbreviata (de Ryckholt.)
Clinopistha parvula, de Kon.
Nothamusium radiatum, Hind.
Conocardium aliforme (Sow.)
Bellerophon sp.
Dentalium ingens (de Kon.)
Euomphalus pentangulatus, Sow.
Euomphalus cirrus, Sow.
Loxonema lefebvrei, L'Eveillé.
Loxonema rugifer, Phill.
Macrocheilina acuta, Sow.
Macrocheilina rectilinea, Phill.
Macrocheilina sp.
Murchisonia telescopium, Haughton.
Naticopsis variata (Phill.)
Naticopsis plicistria (Phill.)

Faunal List (continued) :—

Naticula tabulata (Phill.)
Pleurotomaria carinata, Sow.
Pleurotomaria decipiens, M'Coy.
Platyschisma zonites, M'Coy.
Orthoceras gesneri (Sow.)
Actinoceras giganteum (Mart.)
Ephippisceras bilobatum (Sow.)
Nautilus ingens (Mart.)
Nautilus nodiferus, Armstrong.
Sohenscheilus cf. crassiventer, de Kon.
Thyringoceras hibernicum, Foord.
Vestinautilus cariniferus (Sow.)
Vestinautilus cf. crateriformis.
Phillipsia derbiensis (Mart.)
Phillipsia gemmulifera (Phill.)
Phillipsia scabra, H. Woodward.
Griffithides longispinus, Portl.
Psammodus rugosus, Ag.
Petalodus hastingsii, Owen.
Cladodus.

Notes :—The Fourlaws Limestone is a richly fossiliferous bed; cephalopods and gasteropods are numerous. All the forms in the above list are from the Waterfalls quarry near the village of Redesdale.

The faunal lists of the Fourlaws and Redesdale Limestones and the Redesdale Ironstone Shale have been considerably augmented by the addition of genera and species supplied by Mr. John Dunn's fine collection of Redesdale fossils. I have completed the list of the lamellibranchs from the list recently drawn up by Dr. Wheelton Hind.

The Woodend and Dun Limestone.

The Woodend Limestone=The Hobberlaw Limestone=The Redesdale Limestone.

Geographical Distribution.

The outcrops of the Woodend and Dun Limestones form with the Carbonaceous beds a belt girdling the Cheviots on the east and north, but separated from the volcanic mass by the Tuedian beds. Approaching the Tweed this belt bends round to the east and strikes out to sea south of Tweedmouth.

Stratigraphical Character.

Both compact beds; the Woodend is about 10 or 12 feet in thickness, the Dun about 6 feet.

Woodend Limestone.

Faunal Diagnosis.

CORALS :—

Lithostrotion maccoyanum, *L. irregulare*, and *L. junceum* abundant. *Dibunophyllids* not uncommon.

BRACHIOPODS :—*Productus* α very abundant. Semireticulate *Producti* plentiful.

Faunal List:—

Dibunophyllum sp.
Lithostrotion irregulare (Phill.)
Lithostrotion martini, Ed. & H.
Lithostrotion junceum (Flem.)
Lithostrotion portlocki (Bronn.)var. maccoyanum, Ed. & H.
Zaphrentis sp.
Syringopora sp.
Favositoid coral.
Heterotrypa tumida (Phill.)
Seminula ambigua (Sow.)
Spirifer planicosta, M'Coy.
Giganteid Producti (Productus α)
Productus longispinus, Sow.
Productus semireticulatus (Mart.) cf. P. pugilis, Phill.
Aviculopecten.
Lithodomus lingualis (Phill.)
Bellerophon sp.
Dentalium ingens, de Kon.
Euomphalus pentangulatus, Sow.
Loxonema murchisoniana, de Kon.
Orthoceras sp.
Archæocidaris urei (Flem.) (plates)

NOTES :—*Lithostrotion maccoyanum* occurs in large masses. *Productus semireticulatus* is represented by a small form closely approaching Phillip's *P. pugilis*.

This very fossiliferous bed needs much further exploration.

Dun Limestone.

The bed lies about 100 or so feet below the Woodend Limestone.

Lithostrotion junceum common, *L. irregulare* present. North of the Tweed, *L. maccoyanum* plentiful. Clisiophyllids rare; small gasteropods not uncommon.*

* I am indebted for the information respecting the fauna of the Dun Limestone to Mr. Carruthers and to Mr. Bishop of Berwick. I have examined the bed near Spital but found no fossils.

The Calcareous Beds lying between the Scar Limestone and the Fourlaws Limestone, Tyne and Rede District.

Time has not allowed of a systematic examination of these limestones. In the country north of the Tyne are some ten or so of them, which, although little quarried, are exposed in the numerous burns. To the west of the North Tyne a number of quarries afford access to them.

These limestones mainly belong D2, but the lowest of them yield forms characteristic of D1.

The limestone which lies above the Fourlaws Limestone, and which is exposed in Shanks Kiln Quarry, contains in addition to forms common to D1 and D2 :

Campophyllum derbiense,* Vaughan.
Cyathophyllum murchisoni, Ed. and H.

Through the kindness of Miss Dinning of Simonburn, I have had the opportunity of examining a number of forms she has collected from the shale exposed by one of the burns in that neighbourhood. The shale represents a low horizon in II of the table on p. 598, but occurs some distance above the limestone previously mentioned.

Dibunophyllids.
Lithostrotion (? irregulare) (Phill.)
Lithostrotion maccoyanum, Ed. and H.
Fenestella sp.
Rhabdomeson sp.
Athyris planosulcata (Phill.)
? Seminula sp.
Reticularia lineata (Mart.)
Rhipidomella michelini (L'Eveillé)
Orthotetids.
Productus α.
Productus latissimus, Sow.
? Productus longispinus, Sow.
Productus muricatus, Phill.
Productus semireticulatus, Mart.
? Productus martini, Sow.
? Chonetes buchiana, de Kon.
Aviculopecten dissimilis (Flem.)
Pseudamusium anisotum (Phill.)
Amusium concentricum, Hind.
Actinopteria persulcata (M'Coy.)
Pteronites latus (M'Coy.)
Pinna mutica (M'Coy).
Archaeocidaris urei (Flem.) (plates)
Encrinital columns very numerous.

The lamellibranchs constitute a group of forms characteristic of the muddy conditions of deposition.†

* Found by Mr. John Dunn.
† Dr. Wheelton Hind.

Oxford Limestone.

Geographical Distribution.

Sea Houses, Lowick, and Scremerston districts.

Stratigraphical Character.

A compact bed of dark coloured limestone about 15 feet in thickness, rendered conspicuous by the presence of *Girvanella* in the form of red and black concretionary incrustations surrounding the corals and encrinite columns. (Pl. xviii., fig. 2).

Fauna.

Corals numerous; their poor condition however renders their determination difficult. Crushed Dibunophyllids abundant in the overlying shale in the Oxford Quarry (near Ancroft). *Dibunophyllum* nr. ϕ, *Lithostrotion*, Giganteid *Producti* (*Prod. a*) and other forms common.

The "Oxford" is perhaps the most highly encrinital limestone in the Bernician series, although the fragmentary columns of encrinites are abundant in all the calcareous beds.

Lonsdaleia floriformis has been found in a thin limestone 30 or 40 feet above the Oxford Limestone near Scremerston. This form appears to be rare in Northumberland, the author not having seen it in any of the limestones. Messrs. Carruthers and Mauff found it in the bed mentioned above, in December, 1908, and it has been recorded by H.M. Geological Survey from the Eelwell Limestone.

The "Posidonomya Bed."

Budle Bay.

In Budle Bay, between Bamburgh and Holy Island, a red calcareous shale is to be seen overlying a thickly bedded limestone. The shale, which is about 15 feet in thickness, passes upwards into sandstone.

The exact horizon of this shale is doubtful, but geographical and stratigraphical considerations point to its belonging to the Lower Limestone group.

Faunal List.

Chonetes cf. hardrensis (Phill.)
Lingula mytiloides, Sow.
Do. squamiformis, Phill.
Productus scabriculus (Mart.)
Rhipidomella aff. michelini (L'Eveillé).*
Orthotetid.
Spirifer bisulcatus, Sow.*
Posidonomya becheri, Goldf.
Sanguinolites augustatus (Phill.)
Edmondia variabilis.
Bellerophon sp.
Euomphalus pentangulatus, Sow.*
Goniatites sp.*
Phillipsia sp.*
Fenestella sp.*
Land plants.*
Corals and crinoids absent.

NOTES:—This is the only bed in which I have found *Posidonomya*, but Professor Lebour speaks of them as common in several Bernician shales.

The Scar, and the Nine Yards, Eelwell or North Sunderland Limestones.

These two limestones are either the same bed, or very closely approximate to the same horizon.

Scar Limestone.

Geographical Distribution.

Tyne District. Closely associated with the Whin Sill.

Stratigraphical Character.

The limestone, as exposed in the neighbourhood of the Roman Wall, is a black crystalline rock, hardened and coloured by contact with the igneous intrusion. Fossils partially destroyed.

Faunal Diagnosis.

CORALS:—*Diphyphyllum lateseptatum* abundant; Dibunophyllids plentiful.

BRACHIOPODS:—*Productus giganteus*, Martin's species, common.

NOTES:—*Lithostrotion junceum* and *Diphyphyllum lateseptatum* both form bands in the limestone. Spiriferids and other brachiopods plentiful.

Eelwell and North Sunderland Limestone.

Geographical Distribution.

Seen in the coastal section at Beadnell and at Sea Houses. (On account of a large anticline it appears on both sides of

* Recorded by Prof. Lebour. See Lebour—"Posidonomya Beds at Budle." Geol. Mag., Feb., 1885.

the latter village.) At Lowick it has been extensively quarried. Found at the coast again at Scremerston and Berwick.

Stratigraphical Character.

A fairly compact bed of limestone, with a few thin bands of shale interbedded in the calcareous mass. The strata frequently exhibit rolling and other irregularities.

Faunal Diagnosis.

CORALS:—A Caninoid *Campophyllum* and *Zaphrentis* aff. *enniskilleni* characteristic of the limestone at Beadnell and Sea Houses. *Diphyphyllum* aff. *lateseptatum* common at Lowick.

BRACHIOPODS:—*Productus giganteus*, near Martin's species, common.

Faunal List.	Beadnell & Sea Houses.	Lowick.	Berwick.
Campophylloid Dibunophyllum	–		
Cyclophyllum aff. pachyendothecum, Thom. ...	–	–	
Diphyphyllum lateseptatum, M'Coy, and variants ...		–	
Lithostrotion junceum (Flem.)	–	–	
Caninoid Campophyllum	–		
Zaphrentis enniskilleni, Ed. & H.	–		
Heterotrypa tumida (Phill.)	–		
Fenestella	–		
Spirifer trigonalis (Mart.)	–	–	–
Pugnax pleurodon (Phill.)			–
Schizophoria resupinata (Mart.)	–		–
Orthotetid	–		–
Productus giganteus (Mart.)		–	
Productus longispinus, Sow.	–	–	–
Productus semireticulatus (Mart.)	–	–	
Chonetes cf. hardrensis (Phill.)	–		
Lingula mytiloides, Sow.			–
Streblopteria ornata (Eth.)			–
Nuculana attenuata (Flem.)			–
Edmondia sp.	–		
Sanguinolites plicatus (Portl.)	–		
Bellerophon sp. (large)...	–		
Euomphalus pentangulatus, Sow.	–		
Phillipsia eichwaldi, Fischer, var. mucronata, M'Coy...	–		

NOTES:—The "Eelwell" fauna is closely allied to that of the Acre Limestone, but contains fewer Great Limestone forms. The corals, which are very plentiful on the upper surface of the bed at the shore near Beadnell and Sea Houses, are thickened internally and their structure is often obliterated by calcareous matter. In the same locality *Prod. longispinus* and *Spirifer* near *trigonalis* form a band in the shale immediately above the limestone.

The faunal assemblage is an extensive one. From the Eelwell Quarry, Lowick, the late Rev. Edward Jenkinson obtained many of his specimens, now in the Sedgwick Museum, Cambridge. Fragments of encrinital columns are very numerous and frequently attain considerable thickness.

The thin limestone lying below the North Sunderland or Eelwell Limestone, and well exposed on the shore at Beadnell and near Sea Houses, possesses a fauna very similar to that of the thicker bed above it.

From the above locality I have obtained:—

Cyclophyllum aff. *pachyendothecum*.
Lithostrotion junceum.
Caninia sp.
Caninoid *Campophyllum*.
Zaphrentis aff. *cuniskilleni*.
Productus longispinus.
Bellerophon sp., large.

The Five Yards, Six Yards, and Acre Limestones.

The limestones referred to by these names, although occurring in the south, middle and north of the county respectively, are in all probability one and the same calcareous bed.*

Geographical Distribution.

Taken as one bed, the account of geographical distribution of the Great and Four Fathom Limestones equally applies to these limestones. The Five Yards occurs in the Tyne district; the Six Yards has been mapped from the Wansbeck to Beadnell, and the Acre is met with in the Lowick and Scremerston areas.

* Some writers regard the Three Yards Limestone as a southern representative of the Six Yards. There is no doubt as to the identity of the Six Yards and Acre.

Stratigraphical Character.

The Five Yards Limestone, although displaying numerous shaly partings, is free from thick argillaceous horizons. Thickness about 15 feet.

The Six Yards Limestone consists of some 18 or 20 feet of calcareous strata in thick "posts" separated by thin beds of shale. Beneath the limestone is a black shale, which at Little Mill measures some 18 inches in thickness, and contains lenticular masses of limestone and at the base a seam of coal.

The Acre Limestone is a massive limestone about 17 feet thick. Above the main bed is a thin band of calcareous rock intercalated in the overlying shale.

Faunal Diagnosis.

CORALS:—Characteristic forms: *Zaphrentis constricta*, very plentiful; *Zaphrentis* near *oystermouthensis*; *Cyathaxonia cornu*; *Caninia* nov. sp. All occurring in the Acre Limestone, Ancroft.

BRACHIOPODS:—*Spirifer planicosta* and *Spirifer wickensis*, common at Little Mill (Six Yards Limestone). *Productus β* and variants abundant, especially in the Six Yards.

Faunal List.	Five Yards L.	Six Yards L.	Acre L.
Clisiophyllum near subimbricatum, M'Coy ...	–		
Dibunophyllum sp.	–	–	
Koninckophyllum magnificum, Thom. & Nich. ...		–	
Cyclophyllum aff. pachyendothecum, Thom. ...		–	–
Lithostrotion junceum (Flem.)	–	–	
Caninoid Campophyllum	–		
Caninia sp. nov.			–
Cyathaxonia cornu, Nich.			–
Zaphrentis near oystermouthensis, Vaughan ...		–	–
Zaphrentis delanouei, Ed. & H.			–
Zaphrentis constricta, Carruthers		–	–

Faunal List (continued).	Five Yards L.	Six Yards L.	Acre L.
Zaphrentis constricta, towards Z. delanouei mut. parallela, Carruthers		–	
Zaphrentis constricta approaching Z. disjuncta ...			–
Zaphrentis disjuncta, Carruthers			–
Zaphrentis (Densiphyllum) costata (M'Coy) ...		–	
? Aulopora		–	
Heterotrypa tumida (Phill.)		–	–
Fenestella		–	
Rhabdomeson		–	
Athyris planosulcata, var. paradoxa (M'Coy) ...		–	
Athyris cf. lamellosa (Phill.)		–	
Seminula ambigua, (Sow.)	–		
Spirifer planicosta, M'Coy		–	
Spirifer wickensis, Vaughan, n. sp.		–	
Pugnax pleurodon (Phill.)	–	–	
Schizophoria resupinata (Mart.)...		–	–
Orthotetid			–
Latissimoid Producti (Prod. β and var.)	–	–	–
Productus giganteus (Mart.)		–	
Productus aculeatus (Mart.)		–	
Productus fimbriatus, Sow., fragment		–	
Productus longispinus, Sow.	–	–	
Productus longispinus, var. aff. setosus, Phill. ...			–
Productus muricatus, Phill.		–	
Productus martini, Sow.		–	
Chonetes cf. hardrensis...			–
Nuculana attenuata (Flem.)		–	
Bellerophon urei (Flem.)		–	
Euomphalus cirrus, Sow.	–		
Loxonema sp....		–	
Macrocheilina sp.		–	
Cyrtoceras rugosum, de Kon.			–
Orthoceras annulatum, Sow.			–
Orthoceras attenuata (Flem.)			–
Hydreionocrinus globularis, de Kon.		–	
Phillipsia eichwaldi, Fischer		–	
Saccammina carteri, Brady	–	–	–
Serpulites carbonarius, Salter		–	

Zaphrentids determined by Mr. R. G. Carruthers.

NOTES:—*Cyathaxonia cornu* and *Caninia nov. sp.* are restricted to the Middle Skateraw Limestone in the Dunbar district, whilst *Zaphrentis* near *oystermouthensis* is abundant at that horizon. These facts support the correlation of the Acre Limestone and the Middle Skateraw Limestone made by Gunn and Bennie.*

Saccammina carteri is rare in the Five Yards Limestone, but forms a conspicuous band in the Six Yards and Acre Limestones (cf. Four Fathom Limestone). When, as often happens, the matrix containing the foraminifera has perished, the mass has the appearance of coarse oolitic limestone.

The shale at the base of the Six Yards Limestone in the Little Mill Quarry yields almost all the forms recorded here, whilst most of the Acre Limestone forms were found in the shale above the main calcareous bed at Ancroft. *Chonetes* cf. *hardrensis* is exceedingly abundant in the latter shale. *S. carbonarius* was obtained at Snab Leazes Quarry near Alnwick.

The Four Fathom Limestone.

(=Eight Yards Limestone of the Alnwick District and the Lowdean or Sandbanks of the Lowick and Scremerston area.)

Geographical Distribution.

Same as that of Great Limestone.

Stratigraphical Character.

This bed shows great structural change as it is followed from the south-west to the north. At Haltwhistle it consists of over 40 feet of limestone remarkably free from argillaceous intercalations, but contains numerous siliceous layers and nodules of chert. Round Alnwick the Four Fathom Limestone is about 30 feet in thickness and is composed of two calcareous members separated by a band of black shale three and a half feet in thickness. In the numerous chertose bands the upper

* R. G. Carruthers.

member resembles the Haltwhistle facies, but the lower member is built up of thickly bedded strata separated by thin layers of shale. The incomplete exposures between Haltwhistle and Scots Gap exhibit these thick calcareous "posts." In the north, the character of the lower member prevails throughout the bed, but the limestone is strongly argillaceous in the upper portion.

Faunal Diagnosis.

Corals :—Corals rare and mainly pertaining to a Zaphrentid stage.

Foraminifera :—*Saccammina carteri* is the most useful index of this and the underlying limestone.

Faunal List.	Haltwhistle.	Haydon Bridge.	Elf Hills, Cambo.	Denwick Lane.	Cullernose Point.	Scremerston.
? Carcinophyllum						–
Cyclophyllum aff. pachyendothecum, Thom.	–					–
Lithostrotion junceum (Flem.)						–
Caninia sp. near cornucopiæ, Nich. ...	–					
Zaphrentis aff. enniskilleni, Ed. & H. ...	–					–
Palæacis cyclostoma (Phill.)				–		
Fenestella				–		
Seminula ambigua (Sow.)	–	–	–			–
Spirifer trigonalis (Mart.)	–	–		–	–	–
Martinia glabra (Mart.)...			–		–	–
Reticularia lineata (Dav.)	–	–		–		
Pugnax pleurodon	–			-		
Pugnax pleurodon β, Phill.		–				
Rhipidomella aff. michelini (L'Eveillé) ...					–	
Schizophoria resupinata (Mart.)	–	–	–		–	
Orthotetid		–	–	–	–	–
Productus longispinus, Sow.		–				
Productus punctatus (Mart.)		–				
Productus aff. youngianus, Dav. ...		–				
Productus scabriculus (Mart.)		–				
Productus semireticulatus, Mart. ...					–	

Faunal List (continued).	Haltwhistle.	Haydon Bridge.	Elf Hills, Cambo.	Denwick Lane.	Cullernose Point.	Scremerston.
Chonetes cf. hardrensis, Phill.					–	–
Chonetes cf. polita, M'Coy		–	–			
Orbiculoidea nitida (Phill.)			–			
Aviculopecten sp.					–	
Edmondia sulcata (Phill.)		–				
Ctenodonta lævirostris, Portl.			–			
Nucula luciniformis (Phill.)			–			
Nuculana attenuata (Flem.)			–			
Lithodomus lingualis (Phill.)			–			
Grammatodon bistriatus (Portl.)			–			
Grammatodon reticulatus (M'Coy) ...					–	
Grammatodon semistriatus (M'Coy) ...			–			
Indeterminable lamellibranchs			–			
Bellerophon urei (Flem.)	–					
Bellerophon ? decussata (Flem.)					–	
Euphemus sp.					–	
Euomphalus pentangulatus, Sow. ...			–		–	
Loxonema sulcifera, de Kon	–					
Loxonema rugifera, Phill.	–		–			
Macrocheilina ventricosa (de Kon.) ...	–					
Macrocheilina sp.	–		–			
Naticopsis ampliata (Phill.)	–					
Murchisonia sp.	–					
? Ptychomphalus sp.	–					
Small Gasteropods, doubtful forms ...	–					
Orthoceras attenuatum (Flem.)					–	
Orthoceras sp....			–			
Archæocidaris (spine)		–				
Hydreionocrinus sp.						–
Phillipsia eichwaldi, Fischer, var. mucronata, M'Coy			–		–	
Copodus spatulatus, Davis					–	
Serpulites carbonarius, Salter				–		
Saccammina carteri, Brady			–			

Notes:—The Brachiopods comprise no very distinctive forms, but connect the Four Fathom Limestone with the Great Limestone above and the "Acre" below.

Saccammina carteri forms a band* in the limestone in the south of the county but is rare in the north (cf. the Acre Limestone).

The rare annelid cases *Serpulites carbonarius* are plentiful at Denwick Lane Quarry near Alnwick.

The overlying shale is usually very fossiliferous. The forms collected in the Cambo Quarry are all from this grey shale.

The Great Limestone.

(=The Dryburn Limestone of North Northumberland.)

From the extreme west this thick bed may be followed across Northumberland almost to the Tweed. Entering the county from Cumberland it runs parallel to the Tyne, never at any great distance from the river, till it approaches Watling Street. At Bewclay it turns northward and continues that course as far as Green Leighton, when it again changes its direction, this time to the north-east. The Great Limestone and the calcareous bed immediately below it are traceable as continuous outcrops onwards from Green Leighton to within half a mile of Lesbury. North of the Aln, faulting destroys the continuity of strike, but the disconnected outcrops with their various dips and strikes form a band, which advancing northwards from Alnwick occupies the coast between Howick Burn and Beadnell. Beyond Beadnell the lower beds (with a few of the middle beds faulted in among them) come into the coastal section. Appearing again on Holy Island, this band of Middle Limestones advances inland to Lowick, when faulting once more diverts its course, and after several repetitions the band finally strikes out to sea at Scremerston.

* I did not see the band at Haltwhistle, but it is very prominent at Haydon Bridge, Fourstones and Ryal.

Stratigraphical Character.

The Great Limestone in the south of Northumberland closely approaches a thickness of 50 feet, consisting of a thick and massive stratum of limestone of 19 feet ("Main Post") succeeded by a series of thin beds separated by shale ("Tumbler Beds.") In Mid-Northumberland although reduced in thickness the bed is more compact and freer from argillaceous intercalations, but it again thickens and becomes more shaly towards the northern boundary of the county, where it is known as the Dryburn Limestone. At Beadnell the limestone is strongly dolomitized.

Faunal Diagnosis.

CORALS:—*Dibunophyllum*, *Koninckophyllum* and *Diphyphyllum* reach their numerical maximum in this bed and display marked specialization and variation. *Lonsdaleia duplicata* and var. *conaxis* are common and widely distributed, and are restricted to the Great Limestone.

BRACHIOPODS:—No very distinctive forms. Latissimoid *Producti*, (*Prod.* β and variants) *Spirifer trigonalis*, *Reticularia lineata*, *Martinia glabra* and *Athyris planosulcata* very plentiful.

Faunal List.	Haltwhistle District.	Fourstones and Chollerford.	Greenleighton District.	Newton on the Moor and High Whittle.	Beadnell.	Lowick and Scremerston.
Dibunophyllum muirheadi, Nich. & Thom. and vars.		–	–			–
Dibunophyllum muirheadi, var. D. splendens, Nich. and Thom.						–
Dibunophyllum near ϕ, Vaughan ...		–	–		–	
Dibunophyllum : Cyathophylloid, Campophylloid and other variants		–	–			–
Cyclophyllum aff. pachyendothecum, Thom.		–	–			–

Faunal List (continued).	Haltwhistle District.	Fourstones and Chollerford.	Greenleighton District.	Newton-on-the-Moor and High Whittle.	Beadnell.	Lowick and Scremerston.
Koninckophyllum magnificum, Nich. and Thom.		–		–	–	–
Koninckophyllum near interruptum Nich. and Thom.		–				
Diphyphyllum dianthoides, M'Coy=Koninckophyllum interruptum						–
Diphyphyllum lateseptatum, M'Coy ...		–				
Lonsdaleia duplicata, Phill.			–			
Lonsdaleia duplicata, Phill., var. conaxis, M'Coy		–	–		–	–
Campophyllum murchisoni, Ed. and H., Diphyphylloid mut.						–
Zaphrentis constricta, Carruthers MS. ...				–		
Zaphrentis constricta near Z. delanouei, mut. parallela, Carruthers MS. ...				–		
Syringopora sp.		–				
Alveolites septosa (Flem.)		–	–	–	–	–
Alveolites depressa (Flem.)		–	–			
Palæacis cyclostoma (Phill.)				–		
Heterotrypa tumida (Phill.)				–		
Fenestella		–				
Athyris cf. lamellosa, L'Eveillé		–				
Athyris planosulcata (Phill.)		–	–			
Seminula ambigua (Sow.)		–	–	–		
Dielasma gillingensis (Dav.)				–		
Dielasma vesicularis (de Kon.)	–					
Spirifer trigonalis (Mart.)	–	–	–	–		–
Spirifer bisulcatus, var. calcaratus (M'Coy)		–				
Reticularia elliptica (Phill.)			–			
Reticularia lineata (Dav.)		–	–	–		
Martinia glabra (Mart.)		–	–			
Martinia ovalis (Phill.)		–				
Pugnax pleurodon (Phill.)						
Pugnax cf. acuminatus (Mart.)		–				
Schizophoria resupinata (Mart.)	–	–				
Leptæna analoga (Phill.)		–				

Faunal List (continued).	Haltwhistle District.	Fourstones and Chollerford.	Greenleighton District.	Newton-on-the-Moor and High Whittle.	Beadnell.	Lowick and Scremerston.
Orthotetids	–	–	–	–		–
Latissimoid Producti (Prod. β and var.) ...	–	–	–	–	–	
Productus latissimus, Sow., fine ribs ...						–
Productus giganteus (Mart.)		–				–
Productus longispinus, Sow.	–	–	–	–		
Productus muricatus (Phill.)				–		
Productus near margaritaceus (Phill.) ...		–				
Productus semireticulatus (Mart.) ...		–				
Productus sulcatus, Sow.		–				
Productus scabriculus (Mart.)		–				
Productus punctatus (Mart.)		–				
Productus aff. fimbriatus (J. de C. Sow.) ...						–
Productus aff. aculeatus (Mart.)				–		–
Chonetes cf. hardrensis (Phill.)	–	–		–		–
Allorisma sulcata (Flem.)		–				
Nucula gibbosa (Flem.)				–		–
Lithodomus lingualis (Phill.)						–
Pinna flabelliformis (Mart.)						–
Bellerophon urei, Flem....				–		
Bellerophon sp.						–
Euomphalus sp.		–				
Loxonema sp.		–				–
? Polyphemopsis		–				
? Straparollus sp.		–				
Actinoceras giganteum (Sow.)		–				
Actinoceras striatum (J. Sow.)		–				
? Poterioceras						–
Phillipsia sp.		–				
Poecilodus jonesii, M'Coy				–		
Psephodus magnus, M'Coy						–
Saccammina carteri, Brady	–					

Notes.—The coral fauna, although presenting standard conditions of deposition, nevertheless includes one or two representatives of the Zaphrentid phase, *e.g.*, *Zaphrentis constricta*,* which occurs in the shale† above the limestone at Newton-on-the-Moor, together with *Palæacis*.

For notes on the Clisiophyllids see page 632.

The corals are most abundant in the lower and massive portion of the limestone. At Lowick and Scremerston the corals are not only remarkable for their great numbers, but also on account of their excellent state of preservation. *Alveolites septosa* and var. *depressa* occur as thin sinuous bands often coalesced into masses. At Chollerford the base of the limestone is almost entirely formed of Alveolites.

Actinocerata frequently attain a great length. Specimens twelve feet long are by no means rare.

At White Houses a thin bed of sandstone four feet in thickness, intercalated in the shale a few feet above the Great Limestone, is full of *Productus latissimus* and bisulcate Spirifers.

The Little Limestone.

Geographical Distribution.

On entering the county from the west this bed runs along the Tyne valley till approaching Watling Street, when it changes its eastern course for a northern one. It turns slightly to the east again beyond Scots Gap and runs N.N.E. to within a mile of Brinkburn. North of this point it has not been mapped, though borings prove its presence. In the neighbourhood of Fallowfield several faulted outcrops occur.

Stratigraphical Character.

Fairly compact bed, but the upper portion is rather argillaceous in places.

Faunal Character.

No distinctive forms have yet been collected, the faunal

* A. Vaughan.

† I have been informed by Prof. Lebour that in a plantation near Hartington this shale was exposed as the bank of a burn and was full of small *Chonetes*.

assemblage presenting a much impoverished repetition of the Great Limestone fauna.

Faunal List:—

? Dibunophyllid
? Diphyphyllum lateseptatum M'Coy
Athyris planosulcata (Phill.)
Seminula ambigua (Sow.)
Bisulcate Spirifers
Martinia glabra (Mart.)
Reticularia lineata (Dav.)
Schizophoria resupinata (Mart.)
Productus aff. aculeatus (Mart.)
Productus concinnus, Sow.
Productus longispinus, Sow.
Productus muricatus, Phill.
Productus scabriculus (Mart.)
Chonetes cf. hardrensis (Phill.)
Bellerophon sp.
Petalodus acuminatus (Ag.)

NOTES.—*Productus concinnus* occurs in great numbers in the baked and crystalline rock seen above the basalt at Haydon Bridge. Most forms in the above list are from Fallowfield near Hexham.

The Corbridge Limestone.

Geographical Distribution.

The limestone is to be seen in the neighbourhood of Corbridge along several faulted outcrops. One of these runs through the town, and is exposed by quarries near the potteries. Another occurs near Aydon Castle. The closed outcrop of brecciated limestone at Halton Shields is undoubtedly the Corbridge Limestone. The bed sweeps round Stamfordham on the east, and has been mapped as far as West Belsay.* It has not yet been correlated with any of the upper limestones on the north of the Wansbeck.

Stratigraphical Character.

A compact, thinly-bedded limestone resembling the lower division of the Thornbrough Limestone. It rests upon sandstone. Thickness, 16 feet at Halton Shields.

Palæontologically, as well as stratigraphically, the Corbridge Limestone resembles the lower member of the Thornbrough Limestone.

* The older geological maps give a very different interpretation of the outcrops from the later edition, and are undoubtedly wrong. The data collected for this paper support the results of the revision.

Alveolites septosa conspicuous but not abundant. *Seminula ambigua* and other small brachipods common. *Producti* uncommon; the strong ribbed *P. latissimus* occurs. *Edmondia sulcata* very plentiful.

Faunal List.

Alveolites septosa (Flem.)
Fenestella
Seminula ambigua (Sow.)
Productus latissimus, Sow, coarsely ribbed.
Productus giganteus var. nov. or abnormal form
Productus longispinus, Sow.
Lithodomus jenkinsoni (M'Coy) †
Edmondia sulcata (Flem.)
Bellerophon sp.

NOTES.—The *Alveolites* is found as small tumulary masses. The bed needs more investigation.

The Thornbrough Limestone.

Geographical Distribution.

Exposed in the north bank of the Tyne near Styford Hall, the limestone occupies a wide outcrop at Thornbrough to the east of Corbridge, and has been traced northwards by Stamfordham, through Belsay Park to a point beyond the river Blyth. The Stanton Limestone on the east of the village of that name is a continuation of the Thornbrough Limestone.

Stratigraphical Character.

This limestone retains for a distance of 19 miles the character it possesses at Styford, where a thick black shale is seen sandwiched between the two beds of limestone. Total thickness (average) about 18 or 20 feet. Central shale thickest at Styford and Stanton—the two extremities.

Faunal Diagnosis.

CORALS.—*Dibunophyllum muirheadi* and *Cyclophyllum* aff. *pachyendothecum* plentiful; *Lithostrotion* rare or absent.

BRACHIOPODS.—*Productus latissimus* Sow. and latissimoid *Producti* (*Prod.* β and var.) abundant; *P. muricatus* plentiful; *P. scabriculus* common.

† Halton Shields.

Faunal List.	Styford.	Corbridge.	Belsay.	Stanton.
Dibunophyllum muirheadi, Thom. & Nich. (typical)		–		
Dibunophyllum sp., poor				–
Koninckophyllum magnificum, Nich. and Thom.		–		
Aspidophyllum		–		
Cyclophyllum aff. pachyendothecum, Thom.		–		–
Alveolites septosa (Flem.)			–	
Fenestella	–	–	–	–
? Hemitrypa sp.			–	
Rhabdomeson		–	–	
? Pemmatites sp.				–
Athyris royssii, L'Eveillé	–			
Seminula ambigua (Sow.)	–	–	–	–
Dielasma (? hastata) (Sow.)			–	
Bisulcate Spirifers towards S. trigonalis (Mart.)	–			–
Spiriferina sp.				–
Reticularia lineata (Dav.)	–			
Pugnax pleurodon (Phill.)			–	
Leptæna analoga (Phill.)				–
Rhipidomella aff. michelini (L'Eveillé) ...			–	
Schizophoria resupinata (Mart.) ...	–	–		–
Orthotetids	–	–	–	–
Latissimoid Producti (Productus β and variants)		–	–	
Productus latissimus, Sow., coarsely ribbed		–		–
Productus giganteus (Mart.), cf. pl. 38, Davidson's Monograph		–		
Productus longispinus, Sow.	–	–	–	–
Productus muricatus (Phill.)	–		–	
Productus aculeatus (Mart.)		–		
Productus punctatus (Mart.)		–	–	–
Productus scabriculus (Mart.)	–	–	–	–
Productus semireticulatus (Mart.), very large forms, cf. fig. 1, pl. 43, Davidson's Monograph				–
Productus semireticulatus, including P. cf. pugilis (Phill.)	–	–	–	–

Faunal List (continued).	Styford.	Corbridge.	Belsay †	Stanton.
Chonetes cf. hardrensis (Phill.)	–		–	
Lingula squamiformis, Phill.				–
Aviculopecten sp.			–	-
Pinna flabelliformis (Mart.)		-		
Allorisma sulcata (Flem.)	–			
Edmondia expansa, Hind.			B	
Nuculana attenuata (Flem.)	-			
Grammatodon semistriatus (Mart.) ...		–		
Euomphalus pentangulatus, Sow. ...				–
Loxonema sp.	–			
Orthoceras sp				–
Pleuronautilus sp.	–			
Archæocidaris urei (Flem.) (plates) ...				–
Platycrinus rugosus, Miller (plates), cf. fig. in Portlock's Geology of Londonderry, pl. 16, fig. 3	–			
Rnodocrinus sp.	-			
Phillipsia eichwaldi, Fischer	–	–	–	

NOTES.—The *Dibunophyllum muirheadi* of this horizon presents typical forms of the species and strongly Aspidophylloid variants. Although I have only found the species at Thornbrough, it is hardly likely that the coral is restricted to this locality. The *Cyclophylla* attain considerable size. The whole horizon is richly fossiliferous, especially the central shale.

The Robsheugh Limestone.

Geographical Distribution.

The Geological Survey have mapped this limestone from Whittle Dene Waterworks, Harlow Hill, to Belsay, east of the Hall.

Stratigraphical Character.

Thickness at Robsheugh 16 feet. The upper part of the bed is shaly.

Faunal Diagnosis.

CORALS.—*Cyclophyllum* aff. *pachyendothecum* abundant.

† Under Belsay are recorded one or two forms from Bygate (indicated by a B).

BRACHIOPODS.—*Productus giganteus*, Martin's typical form, is common.

Faunal List.

Cyclophyllum aff. pachyendothecum, Thom.
Aulophyllum
Cyathophylloid Clisiophyllid, genus nov.
Lithostrotion junceum (Flem.)
Seminula ambigua (Sow.)
Latissimoid Producti (Productus β) and variants
Productus aff. aculeatus (Mart.)
Productus giganteus (Mart.), very large specimen
Productus semireticulatus (Mart.)
Euomphalus pentangulatus, Sow.
Edmondia sulcata, Phill.

NOTES.—*Productus giganteus*: this very large variety is identical with those abundant in the Yoredale Limestones in Wensleydale and Swaledale, and closely resembles the figure in Davidson's Monograph, plate 38. The variety is finely ribbed, but the pedical valve has strong marginal folds, and the shell is very thick.

Fell Top Limestone.

Geographical Distribution.

The bed outcrops in Allendale and Hexhamshire. It passes beneath the Tyne in the neighbourhood of Bywell, but is not exposed. It runs N.N.E. by Harlow Hill, Stamfordham, and Mitford, and reaches the coast near Alnmouth.

Stratigraphical Characters.

Between the Tyne and the Pont the Fell Top Limestone is at least 20 feet in thickness, and consists of three calcareous beds separated by two argillaceous horizons. At Alnmouth it is represented by two thin seams of limestone, 18 inches and 9 inches respectively, divided by 6 inches of shale.

Faunal Diagnosis.

CORALS.—*Dibunophyllum muirheadi* (mut. cf. *Dib.* ψ) and *Phillipsastræa radiata* plentiful and characteristic; *Lithostrotion junceum* prolific, and *Lithostrotion portlocki* abundant; *Cyathophyllum regium*, towards *Cyathophyllum* ϕ, not uncommon.

BRACHIOPODS.—Latissimoid *Producti* (*Prod.* β) and varieties exceedingly abundant.

Faunal List.	Harlow Hill and District.	Alnmouth.
Dibunophyllum aff. muirheadi (mut. cf. Dib. ψ Vaughan)	–	
Cyclophyllum aff. pachyendothecum, Thom. ...	–	–
Koninckophyllum sp.	–	
Cyathophyllum aff. regium, Phill. (variant towards Cyath. ϕ, Vaughan)	–	
Caninia oystermouthensis n. sp., Vaughan ...	-	
Lithostrotion junceum (Flem.)	–	–
Lithostrotion portlocki (Bronn.)	–	
Phillipsastræa radiata (S. Woodward)	–	
Alveolites septosa (Flem.)	–	
Alveolites near depressa (Flem.)	–	
Fenestella	–	–
Rhabdomeson and other Bryozoa	–	
Seminula ambigua (Sow.)	–	
Bisulcate Spirifers	–	–
Orthids, crushed and imperfect forms. Probably including both Rhipidomella aff. michelini (L'Eveillé) and Schizophoria resupinata (Mart.)...	–	
Orthotetids	–	
Latissimoid Producti (Productus β and variants) ...	–	–
Productus cf. edelburgensis, Phill.	–	
Productus longispinus, Sow.	–	–
Productus muricatus, Phill.	–	–
Productus punctatus (Mart.)	–	–
Productus semireticulatus (Mart.)	–	–
Chonetes buchiana, Phill.	–	
Chonetes cf. hardrensis, De Kon.	–	
Aviculopecten sp.	–	
Pinna flabelliformis (Mart.)	–	
Leiopteria (? laminosa) (Phill.)	–	
Edmondia sulcata (Phill.)	–	
Sanguinolites sp.		–
? Eumicrotis sp.	–	
Conocardium sp.	–	
Bellerophon (? urei), Flem.		–

Whilst carrying out the investigation of the higher beds I had the assistance on several occasions of Messrs. Herdman, Ingram, and McKay.

Faunal List (continued).	Harlow Hill and District.	Ahmouth.
Euomphalus pentangulatus, Sow.	–	
Loxonema imperidens, M'Coy	–	
Platyceras sp. (young form of P. neritoides, Phill., or P. vetustum (Sow.)*	–	
Phillipsia sp.	–	
Poecilodus jonesii (M'Coy)	–	
The following additional forms are contained in Professor Lebour's lists of Fell Top Limestone fossils.†		
Lingula squamiformis, Phill.		–
Macrocheilus sp.		–
Murchisonia sp.		–
Orthoceras attenuatum, Flem.		–
Poteriocrinus nuciformis, M'Coy		–
Poteriocrinus sp.	–	
Griffithides farnensis, Tate		–
Griffithides sp.	–	
Chomatodus cinctus, Ag.	–	
Petalodus acuminatus, Ag.		–

Notes.—The shale, especially the upper bed, is conspicuous on account of the great quantity of encrinital columns, *Fenestella*, and crushed and fragmentary shells that it contains. These are of a white colour, and give an unmistakable identity to the bed. *Lithostrotion junceum* is present in most of the Bernician limestones, but it is particularly abundant in the "Fell Top" and the "Redesdale." The *L. junceum* characteristic of the latter bed possesses remarkably long and straight corallites, whereas that typical of the Fell Top Limestone is stunted and tortuous in growth. *Lithostrotion portlocki* is also abundant in the Redesdale Limestone, and the smaller variety *L. maccoyanum* occurs in

* Determined by Dr. Bather. This and several other forms in faunal list of this and the Thornbrough Limestone were collected by Mr. G. Weyman.

† * See Lebour—Geology of Northumberland, page 110.

very large quantity in the Woodend Limestone as well as in other Lower Bernician beds, but I have not found the species in the limestones between the Fell Top Limestone and the beds of the lower group. A piece of the carbonized remains of a plant occurred in a thick post of limestone in Crossedge quarry, Newton, near Corbridge.

VII.

DESCRIPTION OF CERTAIN CORALS AND BRACHIOPODS.

CORALS.

Clisiophyllids.*

Dibunophyllum θ Vaughan.—Form cylindrical. Central area bisected by flexuous plate not specially thickened. The lamellæ are irregular and flexuous, and extend from the boundary of the area to the plate, with which they frequently inosculate. External area: very short minor septa and very open loose vesicles. No marked peripheral area, since all the septa extend almost or quite to the wall. The narrow cylindrical form from the Redesdale Limestone is probably this species, but the specimens obtained were badly preserved. The *Dibunophyllum* from the Redesdale Shale is a variant in which the mesial plate is difficult to trace, and in which the lamellæ inosculate.

In certain forms of *Dibunophyllum muirheadi* from Scremerston the vesicles of the external area are loose; these forms approach near to *Dibunophyllum* θ, but differ in the greater or less shortening of the lamellæ so that they do not reach the mesial plate.

Dibunophyllum muirheadi and the var. *D. splendens*, characteristic of the Dryburn Limestone, are large and cylindrical. The central area is on the plan of *Dibunophyllum* θ, but the vesicles are much more closely packed, especially in the case of *D. splendens*. The central area is completely bisected by a mesial plate, but the lamellæ which extend inwards from the boundary of the area do not usually reach the plate (a stage towards *Aspidophyllum*).

* Notes on the Clisiophyllids by Dr. Vaughan.

Dibunophyllum ϕ Vaughan.—This form, which differs from *Dibunophyllum* θ in the length of the minor septa that traverse the external area, and in the more strongly packed vesicles, as well as in its narrow corallum, occurs in the Great Limestone, and has been also obtained from a bed which is probably the Redesdale. In the South-West Province the species is most abundant in D1, but extends to D2.

Dibunophyllum muirheadi mut. (cf. *Dibunophyllum* ψ Vaughan).—This species is characteristic of the Fell Top Limestone. Compared with the type species the form is small and conical. The central area is typically Aspidophylloid, having a conspicuous plate projecting into the fossula and abruptly terminated before reaching the opposite side of the area. The lamellæ are conspicuously shortened. The external area is closely packed with vesicles, and the minor septa are longer than in the typical form of *D. muirheadi*, although never reaching the medial area. *Dibunophyllum* ψ differs in having longer minor septa, which traverse the whole external area, and less shortened lamellæ.

Aspidophyllum sp.—A typical *Aspidophyllum* (with shortened lamellæ, an indistinct mesial plate, and septa separated off into groups by wider interspaces) occurs in the Stamfordham Limestone at Corbridge.

Cyclophyllum aff. *pachyendothecum*.—The central area is enclosed by a loose wall, and is not so strongly cuspidate as in *C. pachyendothecum*, Thomson.

A Clisiophyllid of Cyathophylloid habit.—Central area not distinctly marked off from the medial area, simple and Dibunophylloid, with very inconspicuous tabular intersections and a few irregular lamellæ. Medial area broad and traversed by long, thickened, close-set septa; regularly spaced intersections in the interseptal spaces. External area narrow and occupied by thin extensions of the primary septa and by thin minor septa. Very minute vesicles occupy the septal interspaces; consequently, when mineralized, the external area appears as a dense narrow ring in which the true structure is obscured. Occurs in the Robsheugh Limestone. (Plate xvi., fig. 6).

Clisiophylloid *Lithostrotion*.—Thin septa, as in *Lithostrotion*, in the narrow external area. The central area is composed of a trabeculate columella entirely surrounded by a mesh of lamellæ and concentric intersections. Common in D1 of the South-West Province; not uncommon in the Redesdale Limestone. (Plate xvi., fig. 10).

Favositids.

Palæacis cyclostoma (Phill.)—I obtained a number of these corals, each attached to the back of a *Chonetes*, from the base of the shale overlying the Great Limestone at the quarry close to High Whittle. Edwards and Haime in their monograph on Carboniferous corals (Pal. Soc., vol. 6, 1852) gave *Palæacis cyclostoma* as the only species of its genus reported from the Carboniferous, the other known species belonging to the Silurian. Phillips (Geol. Yorks., II., p. 202, pl. 11, fig. 9) figures the species, and mentions Northumberland as the only known locality in which it is found.

There are two sets of specimens from Newton-on-the-Moor, one mile south of High Whittle, in the British Museum Catalogue, registered as B2700 and 50939*.

BRACHIOPODS.

Productus.

The Giganteid Group.—In the Lower Bernician giganteid *Producti* are exceedingly abundant, and display important variation from the typical *Productus giganteus* of Martin. In the Middle and Upper beds they are much scarcer, and in place of the specialized forms which characterize the lower horizon the huge *Productus giganteus* and smaller latissimoid forms occur. The large species of Martin have very thick shells, fine striæ, and strong marginal folds.

Productus a.—This, the predominating type of the Lower Bernician giganteid group, differs from the typical form in being smaller, more globose, and in having a more acute beak. The striæ are somewhat coarser, but the marginal folds are inconspicuous. The ears are small, though distinct

* Kindly communicated to me by Dr. Bather.

from the rest of the shell, and are decorated by concentric wrinkles which extend on to the body of the shell. The spines are few in number. (Plate xvii., fig. 1).

The Latissimoid Group.—The latissimoid *Producti* reach their numerical maximum and acme of specialization in the Middle and Upper Limestones, occurring in great numbers and possessing very wide range of variation, a range which has the typical *P. latissimus* as one extreme and circular and globose forms as the other. The most characteristic and abundant form is *Productus β.*

Productus β.—The variety is more oval in shape and is flatter than Sowerby's type of *P. latissimus*, but it agrees with Davidson's description of the species in the gradual passage of the body of the shell into the auriculate expansions. The shell, being finely striated, has on that account a smooth appearance, and is ornamented with sparsely distributed but stout and erect spines. (Plate xvii., fig. 2).

The Semireticulate Group.—A variant agreeing with *P. pugilis* (Phillips) in respect to strong ridges upon the pedical valve towards the margin and the prominent spines it bears, is the prevailing type of the semireticulate *Producti* found in the Bernician sequence.

P. antiquatus is common in the Fourlaws Limestone and Redesdale Ironstone Shale.

FORAMINIFERA.

Saccammina carteri, Brady (Ann. and Mag. Nat. History, series ii., vol. vii., p. 177, pl. x.; Pal. Soc., vol. 34, 1876).—This small fossil is of the greatest importance as far as Northumberland is concerned, and was long used by the quarrymen as an index of horizon before the principles of zoning were understood. It is found in small quantity in most of the Lower and Middle Limestones, but is abundant in the Four Fathom and the Six Yards or Acre Limestones. The "spotted band," as the thin horizon is called at which it occurs in great quantity, migrates from the Four Fathom to the Acre Limestone northwardly. (Plate xviii., fig. 1).

VIII.

EXPOSURES.

		Quarter Sheet.
	FELL TOP LIMESTONE.	
Newton, near Corbridge	Crossedge Quarry. By the side of the road north of the church.	105 S.W. (New Series 20).
Harlow Hill ...	Quarries on both sides of the village (north and south).	105 N.W. (New Series 14).
Stamfordham ...	Stob Hill Quarry, near entrance to Cheeseburn Grange, by the road.	,,
Milburn ...	Quarry west of Milburn Hall, by the road.	,,
Mitford ...	Bed and banks of Pont, about two miles beyond Mitford.	,,
Alnmouth ...	Exposure on the shore near Foxton Hall.	109 N.W. (New Series 6)
	ROBSHEUGH LIMESTONE.	
Robsheugh ...	Two quarries, one on the south and the other on the north side of Blackheddon Burn, near to Robsheugh (Farm). 1½ miles south-west of Milburn, and close to the cross roads.	105 N.W. (New Series 14).
Belsay ...	Belsay Park—east of the Hall ...	,,
	THORNBROUGH LIMESTONE.	
Styford ...	Exposure in the north bank of the Tyne, half a mile east of Styford Hall.	105 S.W. (New Series 20).
Corbridge ...	Thornbrough Quarry, 1½ miles due east of Corbridge, and situated south of Aydon. Several other exposures are to be seen in the Aydon neighbourhood.	,,

EXPOSURES *(continued)*.

		Quarter Sheet.
Bygate ...	Quarry half a mile north of Black Heddon near to the road.	105 S.W. (New Series 20).
Belsay ...	Quarry north of Belsay Castle, and by the side of the road which runs north of the Park.	,,
Stanton ...	Quarry one mile north of Stanton on the east side of the road.	109 S.W. (New Series 9).
	CORBRIDGE LIMESTONE.	
Corbridge ...	Quarries north of the town near the Potteries; most recent exposure approached by Deadridge Lane, the other quarries lie to the west of the above.	105 S.W. (New Series 20).
Aydon ...	Aydon Castle Quarry, near White House, north of Corbridge.	,,
Halton Shields ...	Quarry in closed outcrop west of village, on the south side of the Military Road.	105 N.W. (New Series 14).
Stamfordham ...	A large but overgrown quarry south of the village, between Stamfordham and Ousten; a small but newer one on the north, close to Mainsbank Farm.	,,
	LITTLE LIMESTONE.	
Haltwhistle ...	Old quarry near Dean Houses, and close to the Military Road.	106 S.E. (New Series 19).
Haydon Bridge...	Exposed in Whinstone quarry above the basalt half-a-mile east of Haydon Bridge station. By the side of the road.	,,
Fallowfield ...	Quarry together with colliery and barytes mine two miles and a half north of Hexham.	106 N.E. (New Series 13)

EXPOSURES *(continued)*.

		Quarter Sheet.
Ingoe ...	Quarry west of village	105 N.W. (New Series 14).
	GREAT LIMESTONE. (= Dryburn of Lowick and North Northumberland).	
Haltwhistle ...	Two old quarries, on the south side of Military Road. Near Inn.	105 S.E. (New Series 19).
Chesterholm ...	Old quarry half-a-mile north of Vindolana.	,,
Haydon Bridge...	Several disused quarries north of Haydon Bridge.	106 S.E. and 106 N.E.
Fourstones ...	Very large quarry, half-a-mile north-west of Fourstones station.	106 N.E. (New Series 13).
Chollerford ...	Two large quarries—"Black Pasture" and "Cocklaw"—both on the east of Chollerton road. "Black Pasture" is about half-a-mile from Chollerford station, and "Cocklaw" another quarter mile east of the first. The sandstone workings above "Black Pasture" serve as a good guide.	,,
Bewclay ...	Quarry by the side of Watling Street north of Stagshawbank.	,,
Ryal & Mootlaw.	An extensive line of quarries mark the Great Limestone escarpment—a conspicuous feature of the landscape.	105 N.W. (New Series 14).
Capheaton ...	Quarry south of Capheaton, about one mile west of Sandybraes.	,,
Cambo ...	Quarry north-west of the village ...	,,
Hartington ...	Quarry north of the village ...	109 S.W. (New Series 9).

EXPOSURES *(continued)*.

		Quarter Sheet.
Green Leighton...	Quarry three-quarters of a mile west of Longwitton station. A field-road leading to the quarry branches from the Rothbury road, a few yards north of the station.	109 S.W. (New Series 9).
White Houses ...	Quarry three-quarters of a mile south-west of Coldrife, and about a quarter of a mile east of railway.	,,
Newton-on-the-Moor	Quarry close to the village ...	,,
High Whittle ...	Quarry near farm and cottages bearing that name.	109 N.W. (New Series 6).
Shilbottle ...	Quarry north of village, near Townfoot Farm.	,,
Ratcheugh ...	Several small exposures	,,
Craster ...	Exposed on the shore ("The Carrs")	,,
Embleton Bay ...	,, ,, ...	,,
Beadnell ...	Great Limestone forms Beadnell Point.	110 S.E. (New Series 4).
Lowick ...	Disused quarry, more than half-a-mile in extent, one mile north of Lowick crossing the Ancroft road. At the foot of the escarpment runs the Dryburn, hence the northern application—"Dryburn Limestone."	,,
Scremerston ...	Quarry (under water) south of the large Sandbanks Quarry (Lowdean Limestone). Spoil heaps afford good collecting. Refuse from this quarry exceedingly rich in corals is to be found in the south end of the Sandbanks Quarry.	110 N.E. (New Series 2)

EXPOSURES *(continued)*.

		Quarter Sheet.
	FOUR FATHOM LIMESTONE. (= Eight Yards Limestone of Alnwick district = Lowdean Limestone of the Lowick and Scremerston district).	
Haltwhistle ...	Two quarries by the side of the Military Road. One near the Inn, the other close to Dean Houses.	106 S.E. (New Series 19).
Haydon Bridge ..	Quarry two miles north of Haydon Bridge, by the side of lane leading to the Roman Road.	,,
Fourstones ...	Quarry in the corner of the plantation west of the large quarries.	106 N.E. (New Series 13).
Ryal ...	Quarry west of village near to the road.	105 N.W. (New Series 14).
Cambo ...	Elf Hill Quarry (disused), near to the road leading to Knowesgate station, and close to the N.B. Railway.	,,
Denwick Lane ...	Disused quarry between Denwick and Little Houghton, one and a quarter miles north-east of the former.	109 N.W. (New Series 6).
Howick and Dunstanburgh	The Four Fathom appears in the cliff immediately south of Cullernose Point; and running on the landward side of the Whinsill, which forms the cliffs between Cullernose and Dunstanburgh, strikes out to sea beyond Castle Point, forming the "Saddle Rock."	,,
Beadnell ...	Exposed at the coast north of Beadnell.	110 S.E. (New Series 4)

EXPOSURES *(continued)*.

		Quarter Sheet.
Holy Island ...	Exposed in cliffs and shore on the north of Holy Island. There is also a quarry in the interior.	110 S.E. (New Series 4).
Scremerston ...	Large quarry two and a half miles south of Spital, between railway and the coast. The bed is extensively exposed along the shore.	110 N.E. (New Series 2).
	FIVE YARDS, SIX YARDS, AND ACRE LIMESTONES.	
	Five Yards Limestone.	
Bardon Mill ...	Quarry by the Military Road east of Borcovicus.	106 N.E. (New Series 13).
Fourstones ...	Quarry south of Limestone Bank and one mile north of the Great Limestone quarry.	,,
Walwick ...	Quarry behind Walwick Hall; also two small exposures west of Walwick by the side of the Military Road.	,,
Lincoln Hill ...	Quarry by the road side between Walwick and Humshaugh.	,,
Bingfield ...	Several small quarries near Bingfield.	,,
	Six Yards Limestone.	
Alnwick ...	Snab Leazes Quarry near Ratcheugh, two and a half miles north-west of Alnwick.	109 N.W. (New Series 6).
Little Mill ...	Quarry close to Little Mill station on the west side of the railway.	,,
Howick ...	Exposed in the cliff and on the shore south of Cullernose Point.	109 N.W. (New Series 6).
Beadnell ...	Shore exposure	110 S.E. (New Series 4).

EXPOSURES *(continued)*.

		Quarter Sheet.
	ACRE LIMESTONE.	
Lowick ...	Several quarries	110 S.E. (New Series 4).
Ancroft ...	Quarry quarter of a mile east of village.	,,
Scremerston ...	Quarry. Coastal exposure ...	,,
	SCAR LIMESTONE.	
Limestone Bank..	Quarry south of Military Road. North of Fourstones.	106 N.E. (New Series 13).
Borcovicus ...	Quarry north of Military Road, near the Roman Camp.	,,
	EELWELL LIMESTONE Or North Sunderland Limestone.	
Beadnell ...	Disused quarry partially filled with water ; also exposure in the cliffs. Both close to village.	110 S.E. (New Series 4).
Sea Houses ...	,, ,, ,,	,,
Lowick ...	An extensive but old quarry, north of village. Several others in neighbourhood.	,,
Scremerston ...	Exposure at the coast near Borewell station.	110 N.E. (New Series 2)
Berwick ...	Exposure at the coast near Berwick Harbour.	,,
	LOWER LIMESTONES OF SOUTH-WEST NORTHUMBERLAND. Although the number of the quarries giving access to these limestones is not great in the Tyne district, yet some exist. The burns however expose the various beds and afford collecting grounds. There are more quarries east of the North Tyne, including the Shanks Kiln Quarry east of Redesdale village.	

EXPOSURES *(continued)*.

		Quarter Sheet.
	OXFORD LIMESTONE.	
Sea Houses ...	Exposure on the shore one mile south of Sea Houses.	110 S.E. (New Series 4).
Low Lynn ...	Quarry one mile west of Beal station	,,
Lowick ...	Several old quarries near Lowick ...	
Oxford ...	Very extensive quarry, but entirely filled with water, near cottages whose name the limestone has taken ; one mile north of Ancroft.	110 N.E. (New Series 2).
Spital ...	Exposure on the shore	,,
	FOURLAWS LIMESTONE.	
Birtley ...	Quarry a mile and a half north of Birtley, near to the road leading from Birtley to Watling Street.	106 N.E. (New Series 13).
Redesdale ...	Waterfalls Quarry, east side of Watling Street, two miles south of Redesdale.	,,
,, ...	Fourlaws Quarry, half-a-mile south of Redesdale.	,,
	REDESDALE LIMESTONE AND IRONSTONE SHALE.	
Birtley ...	Quarry south of village	,,
,, ...	Cornacre Quarry half-a-mile north of Birtley.	
Tone Hall ...	Small wayside quarry half-a-mile north of Tone Hall.	,,
Green Rigg ...	A line of small quarries marks the outcrop of the Redesdale Limestone, where it crosses Watling Street a little to the north of Waterfalls Quarry.	,,

EXPOSURES *(continued)*.

		Quarter Sheet.
Redesdale ...	Extensive exposures of limestone and heaps of fossiliferous shale occur west and south of Redesdale between Watling Street and the railway.	106 N.E. (New Series 13).
Bellingham ...	Shale heaps, near the Woodburn road	,,
	WOODEND LIMESTONE.	
Belford ...	Quarry two miles south of Belford, by the side of the road.	110 S.E. (New Series 4).
Lowick ...	Brownridge Quarry, two and a half miles south of Lowick, by the side of the Wooler road.	,,
,, ...	Highwood Quarry, two miles west of Bowsden, near the wood.	110 S.W. (New Series 3).
Spital... ...	Exposure in cliffs and on the shore ...	110 N.E. (New Series 2).
	DUN LIMESTONE.	
,, ...	Exposure in the cliff and on the shore.	,,
Berwick ...	Exposure along the shore between Berwick and Marshall Meadows.	

EXPLANATION OF PLATES.

Plate I.

Upper Bernician Corals.

Fig. 1. Clisiophyllum *nr.* subimbricatum, Thom.
Five Yards Limestone, Walwick (III.)

2. Dibunophyllum *nr.* muirheadi, Thom. and Nich.
Dryburn Limestone (IVa.)

3. Dibunophyllum *nr.* muirheadi, Thom. and Nich.
mut. cf. Dib ψ —forma nov.
Fell Top Limestone, Harlow Hill (IVc.)

J. W. Tutcher, Photo.

UPPER BERNICIAN CORALS.

Fig. 2.

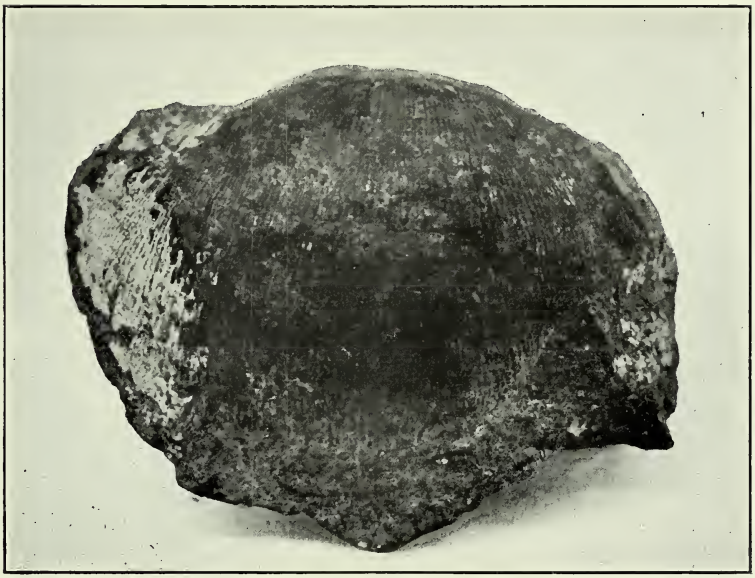


Fig. 1.

A. H. Harrow, Photo.

UPPER BERNICIAN PRODUCTI.

Fig. 1.

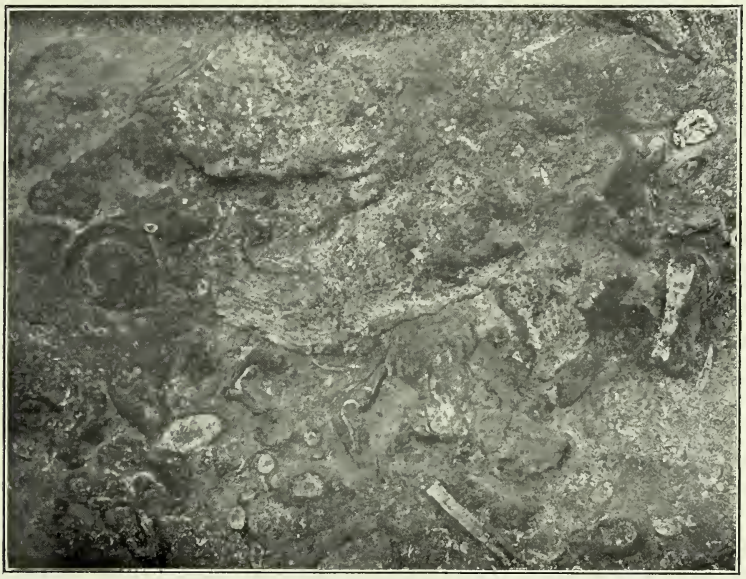


Fig. 2.

A. H. Harrow, Photo.

SACCAMMINA AND GIRVANELLA.
(UPPER BERNICIAN).

Fig. 4. Koninckophyllum magnificum, Thom. and Nich.
Dryburn Limestone (IVa.)

4a. ,, ,, a less specialized variant.
Dryburn Limestone (IVa.)

5. Aulophyllum sp.
(= Cyclophyllum *nr.* pachyendothecum, Thom.)
Great Limestone, Harlow Hill (IVa.)

6. A Clisiophylloid Cyathophyllum.
Robsheugh Limestone (IVb.)

7. Diphyphyllum subibicinum (M'Coy).
Redesdale Limestone (I.)

8 & 8a. Diphyphyllum dianthoides (M'Coy).
(= Koninckophyllum interruptum, Nich. and Thom.)
Dryburn Limestone (IVa.)

9. Carcinophyllum θ, Vaughan.
Redesdale Limestone (I.)

10. A Clisiophylloid Lithostrotion × 1.5.
Redesdale Limestone (I.)

11. Densiphyllum costatum (M'Coy) × 2.
Six Yards Limestone, Snab Leazes Quarries, near Alnwick (III.)

Plate II.

Upper Bernician Producti.

Fig. 1. Productus α, pedical valve × .85.
Fourlaws Limestone (II.)

2. Productus β, pedical valve × .9.
Fell Top Limestone (IVc.)

Plate III.

Fig. 1. Saccammina carteri, Brady × .66.
Acre Limestone, Scremerston (III.)

2. Girvanella encrusting corals and encrinital columns × .9.
Oxford Limestone (II.)

A Contribution towards a Knowledge of the British species of the Order Symphyla.

By Richard S. Bagnall, F.E.S., F.L.S.

(Plate xix., figs. 1–10).

Until 1903, when Professor H. J. Hansen monographed the Order Symphyla in the Quarterly Journal of Microscopical Science (xlvii., pp. 1–101, pls. 1–7), little was known about the species. As long ago as 1845 a British naturalist, Newport, described the species commonly known as *Scolopendrella immaculata*, and from that day to this *Scutigerella immaculata* (Newp.) is so far as I am aware the only species recorded from the British Isles.

In 1907 I collected from various localities forms of Symphyla, which included, so far as I could discriminate, *Scutigerella immaculata* (Newp.), *S. caldaria*, Hansen, *Scolopendrella vulgaris*, Hansen, and an apparently closely allied species, this latter animal being found plentifully amongst the submerged sand and shingle by the sides of the Derwent at Winlaton Mill.

Unfortunately this collection had been mislaid, but as I have discovered *S. vulgaris* in various localities this year, and have, through Dr. Jackson's kindness, had the additional pleasure of examining *S. notacantha*, Gervais, it would seem desirable to record the four species enlarged upon hereafter, of which *S. caldaria*, *S. vulgaris*, and *S. notacantha* are distinct and interesting additions to the British fauna.

As Professor Hansen's very important, exhaustive and interesting monograph is written in English, and published in an English work easily accessible to all scientists, it will not be necessary to enlarge upon the characters of the various species, nor to figure them in detail. In fact I write this paper in the sincere hope that some British naturalist seeing it will take up the study of the British species, and I shall gladly lend my material to any one intending to study the

order more deeply. Towards the end is an account of all European species recognised by Hansen with the localities he gives for them.

My thanks are due to my friends Prof. G. H. Carpenter and Dr. Randell Jackson for the material they kindly submitted to me.

Order SYMPHYLA.

Scutigerella nivea (Scop.) is the first described species of the order, being described by Scopoli as a *Scolopendra* in 1763. Then in 1839 Gervais described *Scolopendrella notacantha* founding the genus *Scolopendrella*, whilst six years later Newport found the commonest known form, *S. immaculata*. It was not until 1880, however, that the group was raised to the rank of a separate order, Symphyla, by Ryder, who characterised the two genera now recognised by biologists.

Genus SCUTIGERELLA, Ryder, 1882*.

The species of this genus are as a rule larger, have the first pair of legs well-developed and more than half the length of the following pair, and the exopods† well-developed and decidedly conspicuous, rarely very short.

The posterior margin of all the dorsal scuta but the last one are slightly rounded or emarginate, with angles often broadly rounded, rarely angular, but when angular each lobe is several times broader than long. The front surface of the hind pair of legs is covered with numerous setæ, whilst the cerci are simple, that is, without the striped terminal area or the transverse lines seen in the cerci of *Scolopendrella*.

Scutigerella immaculata, Newport, 1845. (Pl. xix., figs. 1, 5–6).

A large and variable though very distinct species, sometimes measuring close upon 8·0 mm. in length, it comes in Hansen's first group of the genus, chiefly recognised by the

* Proc. U.S. Nat. Mus., v., p. 234, 1882.

† The exopods are the protruding retractile organs found at the base of each leg of the ten posterior pairs.

very deep and rather large anteriorly-overlapped cavity in the middle of the hind margin of the last dorsal scutum, and the very short backwardly directed antero-lateral setæ of the second dorsal scutum. The antennal joints sometimes reach fifty in number, or, according to Latzel, fifty-five.

Only one other species is placed with *immaculata* in Group I., namely *S. armata*, Hansen, from Algeria.

S. immaculata is apparently widely distributed and common in Europe, being recorded from Norway, Sweden, Denmark, British Isles, Germany, Austria, France, Italy, and Algeria; it is also known from North America.

Comparatively recently Prof. Carpenter has recorded it from various parts of Ireland, whilst Mr. Evans says that it is fairly common and widely distributed in the Forth area, and in addition records specimens from the Tay district. As the species are so much alike it is quite possible that many of the specimens found in our Islands are really referable to other forms; I hope therefore to have the opportunity of examining British specimens later. Prof. Carpenter has already kindly submitted Irish material, of which every specimen is undoubtedly referrable to this species. In my old collection I had specimens taken by Dr. Randell Jackson in Delamere Forest, four or five examples from the Derwent Valley, Co. Durham, and one from Wylam, Northumberland.

This year I have taken two or three specimens in Axwell Park near Blaydon (March, 1910), and several from woods on the banks of the Wear at Leamside (May, 1910).

Scutigerella caldaria, Hansen, 1903. (Plate xix., fig. 2).

Hansen, Quarterly Journal Microscopical Science, xlvii., pp. 36–38, pl. 2, figs. 3a–3g, 1903.

Belongs to Group II. of the genus, and is closely allied to *S. unguiculata*, Hansen, being distinguished by good characters pointed out by Hansen. The form of the hind margin and the longer antero-lateral bristles of the second dorsal scutum, as well as the absence of the cavity in the middle

of the posterior margin of the last dorsal scutum, will at once separate this species from *S. immaculata*.

S. caldaria, as its name implies, is a hothouse species, and is recorded by Hansen from tan-bark in hothouses, Copenhagen, and from the Museum hothouses, Paris.

In my old collection I had specimens clearly referable to *caldaria* taken by myself in very warm hothouses at Wylam, Northumberland, the Kew Gardens, London, and the Botanical Gardens, Glasgow.

Genus SCOLOPENDRELLA, Gervais, 1839.*

Following the characters given for *Scutigerella* we find that the species of this genus are as a rule smaller and more slender, and have the first pair of legs rarely more than one-half the length of the following pair,† more usually rudimentary, consisting of a small wart-like protuberance without claws; whilst none of the exopods are well developed.

The hind margins of all the dorsal scuta but the last one are produced into a pair of triangular plates, most of which are at most only slightly broader than long, and all (except the last pair) rather large.

The front surface of the posterior pairs of legs is furnished with very few setæ. The cerci generally have stripes on the terminal area, and as a rule have, in addition, raised transverse lines on the most distal part outside this area.

Hansen has divided this genus into three distinct groups, of which the first and the third concern us as regards the British species.

The first two groups contain species that have the first pair of legs composed of three free and distinctly articulated joints (not including the trochanter), whilst the tarsus terminates in two conspicuous claws.

In the third group we find species in which the first pair of legs are obsolete, each being represented by a rudimentary wart-like protuberance without even claws.

* Comptes-rendus de l'Académie des Sciences, ix., p. 532, 1839.

† *S. notacantha*, Gervais, is an exception.

Scolopendrella notacantha, Gervais. (Pl. xix., figs. 3, 7, and 9).*

Scolopendrella notacantha, Gervais, Ann. d. Sci. Nat., ser. 3, Zool., ii., p. 79. pl. 5, figs. 15–18, 1844, and Hist. Nat. d. Insectes Aptéres, iv., p. 301, pl. 39, figs. 7–7e, 1847 ; *Grassi*, Mem. d. Reale Accad. d. Sci. di Torina, ser. 2, xxxvii., p. 594, 1886; *Hansen*, Quarterly Journal Microscopical Science, xlvii., pp. 65–68, pl. 5, figs. 3a–3k.

Prof. Hansen points out that the specimens described by Latzel, Muhr, and Berlese as *S. notacantha*, Gervais, do not belong to this species.

This very distinct and interesting animal is the only one belonging to Group I., and is easily separated from all other species by the first pair of legs, which are more than two-thirds the length of the second pair, and of normal shape. The following characters, too, are peculiar to this species. The hind margin of each scutum has a distinct longitudinally striate belt between the pair of triangular processes; the cerci are without the raised transverse lines at the most distal part opposite to the terminal area; the head has the central rod interrupted before the middle, where there is a pair of very short branches, and the anterior branches are scarcely perceptible. These characters, then, separate *S. notacantha* from all known forms of *Scolopendrella s.s.*, and form a connecting link between the two genera. Hansen points out, in addition, that the antero-lateral setæ are longer in *S. notacantha* than in any other European forms.

This species is only definitely recorded from France and Italy, Hansen showing that many records from localities outside of Italy are uncertain or incorrect.

My friend Dr. Randell Jackson took two examples of a *Scolopendrella* in Cheshire, the smaller of which was identified by Mr. Ellingsen, of Kragero, Norway, as *S. notacantha*, Gervais. Dr. Jackson has kindly presented me with these specimens; the smaller one is undoubtedly referable to *S.*

* Dr. Jackson records this capture in an interesting paper on "Some Arthropods observed in 1909" in the *Lancashire Naturalist*, May, 1910, p. 51.

notacantha, but the other is partially dried and mutilated so that it is scarcely possible to venture an opinion as to its identity. I believe however that I can faintly discern characters in the cerci which would seem to show that it is the same species as its mate.

These specimens were taken from under a stone near high-water mark on the tidal estuary of the Dee near Queensferry.

Scolopendrella sp.

In 1907 I discovered several rare beetles, springtails, etc., by examining submerged shingle and sand on the Derwent banks at Winlaton Mill, County Durham. Burrowed fairly deep into this wet mixture of sand and shingle, a minute and slender *Scolopendrella* occurred in numbers; they were allied to the following species, *S. vulgaris*, Hansen, but unfortunately I never had the opportunity of examining them critically, and now they are amongst the lost collection already referred to. As its habitat is a peculiar and specialised one, the species is probably new, and I shall make an effort to find further specimens.

Scolopendrella vulgaris, Hansen, 1903. (Pl. xix., figs. 4, 8, and 10).

Hansen, Quarterly Journal of Microscopical Science, xlvii., pp. 79-81, pl. 6, figs. 6a–6d, pl. 7, fig. 1a, 1903; *S. notacantha* (in part), *Latzel*, Die Myriop. d. österr.-ungar. Monarchie, ii., p. 11, 1884.

I believe that the following characters are the easiest ones by which to separate *S. vulgaris*, Hansen, from the closely allied form *S. isabellæ*, Grassi, both of which form part of Hansen's third group. The cerci of *vulgaris* are sparingly clothed with setæ, which are on an average larger than in *isabellæ*, and a few of them in the lower margin are decidedly longer than the others and prominent, whilst in *isabellæ* they are moderately closely furnished, and many of the longer setæ protrude in all directions. The distance between the triangular processes of the second dorsal scutum is a little longer than

the length of each process; in *isabellæ* it is much shorter than the length of process. The setæ on the scuta are apparently comparatively longer and more sparsely and irregularly placed.

S. vulgaris is recorded from Austria, Italy, Switzerland, Germany, and Denmark, in which latter country Prof. Hansen found it under flower pots in cultivated gardens.

I have found *S. vulgaris* freely in the counties of Northumberland and Durham. In my old collection I had a single specimen from under a flower pot in a garden at Wylam, Northumberland, and four exceedingly large specimens (over 3·0 mm. in length) from under a stone in a quarry at the high end of Axwell Park, County Durham.

I have also a solitary example taken by myself from under a stone on the banks of the Clyde near Bishopton, Scotland.

This year I have taken *S. vulgaris* in the following localities :—

NORTHUMBERLAND.—Two specimens under a board in the grounds of the Hancock Museum, Newcastle, March, 1910.

DURHAM.—Several from under stones in a wood by the north bank of the Wear near Hylton; and in Lambton Park, in Winter Gardens at Sunderland, and one specimen in my garden at Penshaw, March, 1910. One specimen in a garden and another under a stone lying on a damp spot on the cliffs at Hart, March, 1910. Seven or eight specimens under stones in various parts of Axwell Park, April, 1910, and not uncommonly on the north bank of the Tees near Piercebridge, June 25th, 1910.

It will thus be seen that in our county *S. vulgaris* is not confined to cultivated land.

As so much of the foregoing matter is contained in Prof. Hansen's monograph, I should perhaps apologise for dealing somewhat extensively with the four species that we are now able to recognise as British. I do this, however, hoping to draw the special attention of naturalists to this and allied groups, feeling sure that their special study will be an

attractive one, and one that will reward the student. For the same reason I have made a few figures, taking some, where necessary, from Hansen, and have appended the following short account of all the known European and Mediterranean species.

European and Mediterranean Symphyla recognised and described by Hansen :—

1. *Scutigerella immaculata* (Newport). Herein recorded.
2. *Scutigerella armata*, Hansen. Very closely allied to *immaculata*; Algeria.
3. *Scutigerella caldaria*, Hansen. Herein recorded.
4. *Scutigerella nivea* (Scopoli). Austria-Hungary, Russian Poland, Bohemia, Italy. Will probably occur in this country.
5. *Scolopendrella notacantha*, Gervais. Herein recorded.
6. *Scolopendrella microcolpa*, Muhr. Bohemia and Italy.
7. *Scolopendrella subnuda*, Hansen. Italy and Germany.
8. *Scolopendrella isabellæ*, Grassi. Italy.
9. *Scolopendrella vulgaris*, Hansen. Herein recorded.

PLATE XIX. (FIGS. 1–10).

Fig. 1. Scutigerella immaculata (Newport). Second scutum × 38.
,, 2. ,, caldaria, Hansen. Second scutum × 38.
,, 3. Scolopendrella notacantha, Gervais. Second scutum × 52.
,, 4. ,, vulgaris, Hansen. Second scutum × 52.
,, 5. Scutigerella immaculata (Newport). Hind margin of last scutum showing cavity × 38.
,, 6. ,, ,, ,, 12th exopod × 52.
,, 7. Scolopendrella notacantha, Gervais. Central cephalic rod × 52.
,, 8. ,, vulgaris, Hansen. Central cephalic rod × 80.
,, 9. ,, notacantha, Gervais. Lateral view of left cercus × 160.
,, 10. ,, vulgaris, Hansen. ,, ,, × 160.

N.B.—I have attempted to follow Hansen's figures as far as possible; and Figs. 2 and 5 are copied from Hansen.

A Synopsis of the British Pauropoda.

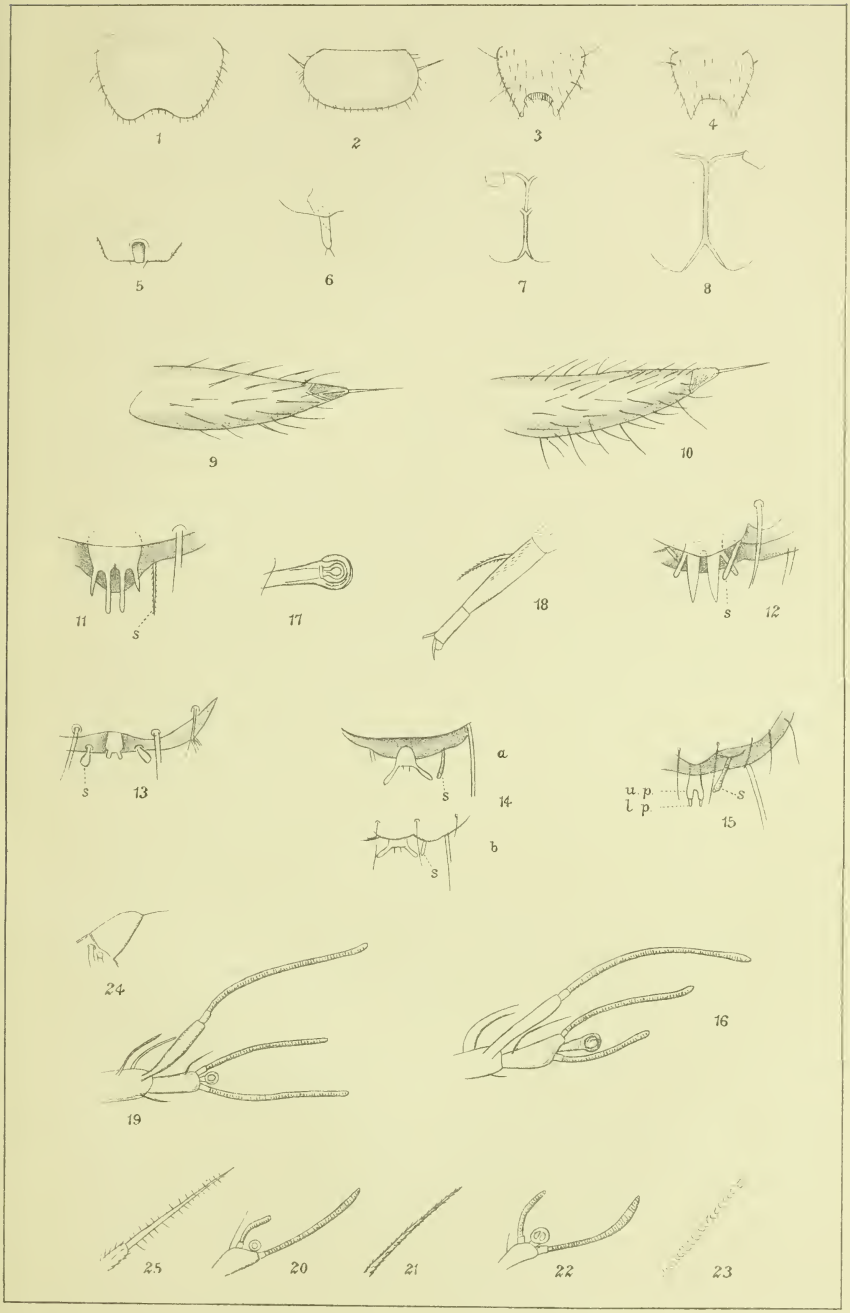
By Richard S. Bagnall, F.E.S., F.L.S.

(Plate xix., figs. 11–25).

Since my recent paper on some Pauropoda from the counties of Northumberland and Durham was published,* I have discovered numerous examples of these curious little animals in many localities, and have every reason to believe that they are more or less common throughout the British Isles. I have therefore thought it desirable to show clearly the distinctive characters of the genera and species now known from our islands, and to illustrate some of the chief features. Though the drawings are rough ones, by reference to figures 11–15 (showing the anal plate of each of the species herein dealt with) it will readily be seen that the form of the anal plate and appendages is an extremely good and valuable character, whilst an examination of the head, antennæ, and other structures brings out a combination of characters almost equally valuable. I feel confident that when British biologists realize how strongly these minute creatures are characterized more interest will be taken in a hitherto neglected order.

Early in February I had the good fortune to find two further additions to our fauna. The first was a new species which from the form of the anal plate would seem to be allied to the Siamese form *P. spinifer*, Hansen; and the second was *P. danicus*, Hansen. Only one specimen of the first was taken, on the banks of the river Wear near Penshaw, and it was unfortunately crushed by the nose of the microscope whilst I was examining it under the 1–12in. oil immersion objective. I hope to meet with it again. *P. danicus* was taken at Sunderland; previously but a single Danish example was known.

* Present volume, p. 462.



R. S Bagnall del
W West lith.

E. Wilson, Cambridge.

BRITISH SYMPHYLA & PAUROPODA.

Order PAUROPODA.

Family PAUROPODIDÆ.

Genus STYLOPAUROPUS (Cook), Hansen.

The lower antennal branch with the fore margin considerably longer than the hind, and its anterior flagellum longer than the other; the globulus placed upon a stalk which is much longer than the transverse diameter of that organ. Sternum of the anal segment with the posterior pair of setæ only.

Stylopauropus pedunculatus (Lubbock). (Plate xix., figs. 11 and 16–18).

There are only two species, so that the following characters, most of which are given by Hansen in his conspectus, will at once distinguish *S. pedunculatus* from *S. pubescens*, Hansen.

Size larger (1·5 to 1·7 mm.), *S. pedunculatus* being the largest known species of the order. Stalk of the antennal globulus obconical. Intermediate hairs in the posterior row on the head as long as, or slightly longer than, the eye mark. Intermediate dorsal setæ on the anal segment a little shorter than the lateral pair. Inner branches of the anal plate rather close to each other, and outer branches pointed at tip and diverging slightly laterally. Body practically naked.

There is a trace of pubescence, very faint, on the outer edge of the legs, but otherwise the animal is devoid of pubescence.

I have again found this little animal in profusion in the Dene near Hylton, and have had specimens of all ages under observation at home. They are hardy little animals, and are easily kept in confinement if care is taken to keep them in a moist place.

I have also a single specimen taken under a stone in a damp wood in the Derwent Valley near Winlaton Mill.

Genus PAUROPUS, Lubbock.

The lower antennal branch with the fore margin shorter than the hind, and its anterior flagellum shorter than the other; the stalk of the globulus as a rule considerably shorter than its diameter, never longer. Sternum of the anal segment with at least two, though more occasionally with three pairs of setæ.

Hansen refers most of the twenty-one species dealt with to three groups, of which *P. huxleyi*, *P. danicus*, and *P. vulgaris* may be regarded as the respective types. As we recognize these three forms (and another) as British, we can conveniently adopt a modified form of Hansen's tabulation, as follows :—

1. Size larger, 1·3 to 1·5 mm., and more robust. The anal plate with four long branches in the same plane, of which the inner pair is longer than the outer. Anterior ventral setæ on the anal segment at least moderately long. Last pair of legs comparatively longer. (Anterior flagellum of the lower antennal branch only slightly shorter than the posterior). **P. huxleyi,** Lubb.

2. Size smaller, 0·6 to 0·9 mm., more slender. Anal plate with two, four (or six) branches, if with four the inner pair is either rudimentary or placed on a decidedly higher plane than the outer. Anterior ventral setæ on the anal segment short or obsolete. Last pair of legs comparatively shorter. (Anterior flagellum of the lower antennal branch one-half, or less than one-half the length of the posterior).

   i. Anal plate with four well-developed branches in two planes. (Last pair of tactile setæ proximally naked and distally faintly pubescent). Form slender. **P. vulgaris,** Hansen.

   ii. Anal plate with two well-developed branches; inner branches absent or obsolete. (Last pair of tactile setæ normal).

      a. Species larger, 0·75 to 0.85 mm. Anal plate posteriorly rather broadly rounded, with its two branches projecting from its hind margin as short cylindrical processes not far from each other; styli shorter and broadly claviform; upper antennal branch distinctly longer than the lower. Form somewhat robust. **P. danicus,** Hansen.

b. Species shorter, 0·6 to 0·7 mm. Anal plate with its lateral margins continued directly in the outer lateral margins of its branches; outer branches long and slender, diverging considerably; inner branches obsolete. Styli slender and larger than the outer branches of the anal plate. Upper antennal branch scarcely longer than the lower. Former extremely slender. **P. gracilis**, Hansen.

Pauropus huxleyi, Lubbock (Plate xix., figs. 12 and 19).

This is the only European species of the first chief group, and easily distinguished by the characters named in the table; it is a larger species than any of the others, and the long hind legs give it a distinctive appearance when examined under a lens in the field.

Since recording it from the Derwent Valley, I have taken another solitary specimen from under a stone lying in a field on the banks of the Wear near Hylton, March, 1910.

Pauropus danicus, Hansen (Plate xix., figs. 13, 20–1).

Hansen, Vidensk. Medd. fra den Naturh. Foren., 1901, figs. 376–378, pl. iii., figs. 4a–4f.

Although Professor Hansen only had a single rather badly preserved specimen of this distinct species, he has described and figured it with singular minuteness. On February 19th of this year I was fortunate enough to discover two male specimens in the Sunderland Winter Gardens, both of which agreed in every detail with Hansen's description of *P. danicus*. The antennal globulus is very small, and placed upon an extremely short stalk, whilst the hair on the anterior margin of the lower antennal branch is not much shorter than the anterior flagellum, the latter being but two-fifths the length of the posterior flagellum. The tactile setæ are more than usually long, and taper from middle to tip, whereas in *P. gracilis* they broaden for two-thirds their length, and from thence scarcely taper.

Whilst *P. danicus* occupies a central position between the two Neotropical species *P. argentinensis*, Hansen, and *P. inornatus*, Hansen, and the Siamese forms *P. elegantulus*, Hansen, and *P. modestus*, Hansen, and is somewhat closely allied to those four animals, it is very sharply divided from all known European species.

British Distribution.—Two males taken from under a board lying on soft earth in the Winter Gardens, Sunderland, February, 1910.

Distribution.—Denmark (Hansen), England. The single Danish specimen was captured in a large wood in the Island of Moen, July, 1892.

Pauropus gracilis, Hansen (Plate xix., figs. 14 and 22–4).

The form of the anal plate and the third pair of tactile setæ at once separates *P. gracilis* from *P. vulgaris*, to which it is somewhat closely related. It is also a smaller and decidedly more slender animal.

I have taken *P. gracilis* in large numbers this year in another part of Gibside, and a few specimens on the banks of the Wear near Hylton, at Leamside, and in gardens at Newcastle, Sunderland, Hart, and Penshaw. When *P. gracilis* occurs amongst frass under the bark of dead trees lying in moist situations, a small white mite may often be seen preying upon it.

Examples have also been met with at Prestwick Carr and on the north bank of the Tees at Piercebridge, Co. Durham, June, 1910.

Pauropus vulgaris, Hansen (Plate xix., figs. 15 and 25).

In my former paper I mentioned the chief characteristics of this distinct form. Further specimens have occurred in the neighbourhood of Penshaw.

EUROPEAN SPECIES NAMED IN HANSEN'S MONOGRAPH.

Pauropodidæ.

1. *Stylopauropus pedunculatus* (Lubbock). Known as British.
2. *Stylopauropus pubescens*, Hansen. Only recorded from a single locality in Germany.
3. *Pauropus huxleyi*, Lubbock. Known as British.
4. *Pauropus danicus*, Hansen. Herein recorded as British.
5. *Pauropus pectinatus*, Hansen. Southern Italy.
6. *Pauropus helveticus*, Hansen. Switzerland only.
7. *Pauropus vulgaris*, Hansen. Known as British.
8. *Pauropus gracilis*, Hansen. Known as British.

Brachypauropodidæ.

9. *Brachypauropus superbus*, Hansen. Italy.
10. *Brachypauropus hamiger*, Latzel. Austria-Hungary.

Eurypauropodidæ.

11. *Eurypauropus ornatus*, Latzel. Austria.
12. *Eurypauropus cycliger*, Latzel. Austria-Hungary.
13. *Eurypauropus latzeli*, Cook (*E. spinosus*, Latzel, not Ryder). Austria and Italy.
14. *Eurypauropus hastatus*, von Attems. Austria.
15. *Eurypauropus pœcillifer*, Silvestri. Italy.
16. *Trachypauropus margaritaceus*, Tömösvary. Hungary.

PLATE XIX. Figs. 11–25.

Fig. 11. Stylopauropus pedunculatus (Lubbock), ♀. Anal plate and stylus (s) from below × 300.

,, 12. Pauropus huxleyi, Hansen, ♀. Anal plate and stylus (s) from above × 450.

,, 13. Pauropus danicus, Hansen, ♂. Anal plate and stylus (s) from below × 300.

,, 14. Pauropus gracilis, Hansen, ♂. Anal plate and stylus (s), *a* from below, *b* from above × 450.

,, 15. Pauropus vulgaris, Hansen, ♂. Anal plate and stylus (s) from above × 450. *u.p.* upper plane, *l.p.* lower plane.

,, 16. Stylopauropus pedunculatus (Lubbock), ♀. Branches of right antenna × 200.

,, 17. Stylopauropus pedunculatus (Lubbock), ♀. Stalked globulus × 400.

,, 18. Stylopauropus pedunculatus (Lubbock), ♀. Right tibia of first pair of legs × 118.

,, 19. Pauropus huxleyi, Hansen, ♀. Branches of right antenna × 200.

,, 20. Pauropus danicus, Hansen, ♂. Lower antennal branch × 225.

,, 21. Pauropus danicus, Hansen, ♂. Distal part of one of the third pair of tactile setæ × 300.

,, 22. Pauropus gracilis, Hansen, ♂. Lower branch of right antenna × 300.

,, 23. Pauropus gracilis, Hansen, ♂. Distal part of one of the third pair of tactile setæ × 450.

,, 24. Pauropus gracilis, Hansen, ♂. Copulatory organ × 300.

,, 25. Pauropus vulgaris, Hansen, ♂. Distal part of one of the third pair of tactile setæ × 600.

On Two New Species of Trichothrips *from the Derwent Valley.*

By Richard S. Bagnall, F.E.S., F.L.S.

In working out some thrips material gathered by myself in Northumberland, Durham, Yorkshire, and Epping Forest I discovered several forms new to the British fauna, including a few previously undescribed species. With the exception of the two species here diagnosed the new ones belong to the Sub-Order *Terebrantia*, and are described in a paper which I propose to contribute to the Journal of Economic Biology.

Sub-Order TUBULIFERA.

Genus TRICHOTHRIPS, Uzel.

Trichothrips propinquus sp. nov.

♀ Length 1·8 mm.

Related to *T. pedicularius*, Hal.

Colour dark reddish-brown shaded with grey in parts, chiefly the sides of head and thorax; end of abdomen and tube yellow; legs yellow, intermediate and hind femora greyish-brown, and fore femora greyish-yellow. Antennæ, including basal joints, ash-coloured, with a tinge of yellow chiefly noticeable in the earlier joints; joints three and four with basal two-fifths and third respectively yellow, and extreme base of fifth similarly yellow.

Head as in *pedicularius* but longer, very slightly longer than broad, and about one-third longer than the prothorax. Relative length of antennal joints 14 : 20 : 30 : 30 : 27 : 24 : 20 : 19. Sense-cones distinctly longer than in *pedicularius*, three on third joint, four on fourth, and two on each of the joints five and six. Ocelli present.

Prothorax transverse, shorter and wider than in *pedicularius*, about one-half as long as broad; all spines apparently present—the pair at anterior angles longer than in *pedicularius*. Pterothorax wider (in *pedicularius* narrower) than the width across fore-coxæ. Wings absent.

Abdomen elongate, only slightly wider than the pterothorax,

and decidedly narrower than in *pedicularius*. Tube comparatively longer than in *pedicularius*, three-quarters the length of the head, about two and one-half times as long as broad at base, tinged with a faint ring of grey at tip. Terminal hairs slender, about as long as tube, and those on ninth segment also slender and about three-quarters the length of tube. Other abdominal bristles moderately strong, curved; the lateral pair on seventh segment the longest of all.

Habitat.—Under bark of ash. There are four specimens in my collection, one taken at Lockhaugh in April, 1904, and carded; one in a wood near Winlaton, May, 1908, and two at Gibside, April, 1909.

Differs from *pedicularius* in its habitat; in having the head brown instead of yellow, the basal antennal joints unicolorous with rest of antennæ instead of clear yellow; the considerably longer sense-cones; the longer head and much shorter prothorax, which is not as long as the head, and is strongly transverse; the broader pterothorax and narrower abdomen, and the slightly longer tube.

Trichothrips longisetis sp. nov.

Trichothrips cæspitis, Bagnall (nec Uzel).

♂ Length about 1·0 mm.

Related to *T. cæspitis*, Uzel.

Colour yellowish; head, ninth abdominal segment and tube uniform dark greyish-brown, and the eighth shaded with grey; prothorax and pterothorax (excepting near base) and all femora light greyish brown. Prothorax, pterothorax, and abdomen irregularly splashed with reddish-brown hypodermal pigment. Antennæ a little more than twice as long as the head, with first and second joints greyish-brown, second with yellowish tinge; third yellow at base and lightly tinged with grey; fourth to eighth light greyish-brown, the fourth being slightly lighter than the following joints. Second joint elongate-cyathiform; third obconical, broader than the others; fourth to sixth roughly clavate; seventh long, widened evenly and roundly from base and then slightly narrowed, truncate

at apex; and eighth narrowing to tip. Relative lengths :— 9 : 14 : 17 : 16 : 16 : 15 : 16 : 10. Sense-cones long and acute.

Head rounded distally, widened slightly from behind eyes to base; slightly longer than width behind eyes, and one and one-third times the length of the prothorax. Ocelli absent. Mouth-cone blunt at tip, much shorter than width at base, and scarcely reaching one-half way across the prosternum. Space between eyes great; postocular bristles placed near side margins of head and rather well back.

Prothorax transverse, twice as broad as long; bristle at each posterior angle long, half as long as the prothorax, and twice as long as the bristle at each anterior angle. Other bristles probably present, but indistinct in the type specimen. Pterothorax only very slightly broader than the width across the fore-coxæ, and almost as long as broad; metathorax evenly and gently narrowed to base of abdomen. Wings absent. Fore-coxæ with a long faintly knobbed bristle; fore legs rather short and broadened; intermediate and hind femora swollen, and tibia short and stout; hind and intermediate tibiæ with a long bristle on the outer side near tip. Intermediate pair the shortest.

Abdomen as broad as the pterothorax, narrowing gently from the sixth segment. Segments strongly transverse, and bristles exceptionally long; those on ninth segment very slender, and at least one and one-half times as long as the tube. Tube short and stout, and two-thirds the length of the head, twice as long as broad at base, and only slightly though evenly narrowed distally; terminal hairs long and slender, like those on the ninth segment, at least one and one-half times as long as the tube.

Male with a pair of long slender spines on the ninth sternite, and a shorter and stouter spine at each hind angle.

Habitat.—A single male taken in moss, Gibside, 1907.

This is the species referred by me* with some little doubt to Uzel's *Trichothrips cæspitis*, to which species it is somewhat closely allied, but quite distinct as will be seen from the above description.

* Entomologist's Monthly Magazine, 2nd series, xix., pp. 3-7, 1908.

Miscellanea.

Further Note on the Fossil Arachnid from Crawcrook.—It now appears that the arachnid described by me (present volume, p. 510) as *Anthracosiro latipes* is identical with the previously described *A. woodwardi*, Pocock. As I pointed out (p. 521), it agreed reasonably well with that species in all but the structure of the legs, and Dr. Bather has since discovered that the original specimens of *A. woodwardi* agree with my specimen in this respect also. The matter is thus referred to by Mr. R. I. Pocock in his "Monograph of the Terrestrial Carboniferous Arachnida of Great Britain" (Palæontographical Society, vol. lxiv., 1911, p. 71):

> In 1909 Mr. E. L. Gill described, under the name *A. latipes*, a species based upon a specimen from Crawcrook, near Newcastle-on-Tyne, which differed apparently from the type of *A. woodwardi* in having the segments of the legs deep and strongly compressed and crested. But by cutting away the matrix imbedding the limbs of examples of *A. woodwardi* in the British Museum, Dr. F. A. Bather has shown that the appendages are constructed as in the type of *A. latipes*. Since Dr. Bather drew my attention to this fact I have been able, through the kindness of Dr. Henry Woodward, to examine a specimen from Sparth, near Rochdale, belonging to Mr. W. A. Parker, which resembles those from Coseley and Crawcrook in the structure of the legs and in other particulars. Although Mr. Gill was perfectly justified on the evidence in describing his specimen as the representative of a new species, I think Dr. Bather is right in his belief that *latipes* must be regarded as a synomym of *woodwardi*.
>
> *E. Leonard Gill.*

The Roseate Tern on the Farne Islands.—John Hancock in his "Catalogue of the Birds of Northumberland and Durham," published in 1873, writes of the Roseate Tern—"a few pairs breed annually on the Farne Islands." Since that date, in spite of the protection afforded it, the Roseate Tern has not increased as a breeding species.

On June 12th, 1909, I saw a single bird on the Knoxes, and watched it settle on its one egg. The keeper afterwards found another clutch of two eggs not far off. He informs me

that all three eggs hatched out and the young were successfully reared. He says he has never seen more than three or four clutches in any season since the Islands were protected.—*George W. Temperley.*

The Little Gull on the Northumberland Coast.—On October 9th, 1909, at the Field Meeting at Cresswell, I saw a single specimen of the Little Gull *(Larus minutus)* fishing out at sea in the company of some Black-heads. It is a very irregular visitant to our coast.—*George W. Temperley.*

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APPENDIX TO THE TRANSACTIONS

THE HANCOCK MUSEUM AND ITS HISTORY*

I.—INTRODUCTORY

The Hancock Museum on Barras Bridge is a familiar object to Newcastle people. Standing in a fine position at the best entrance to the town, it is passed every day by many hundreds of residents, and comes under the notice of almost every visitor. But in spite of this there is reason for thinking that the institution itself, and all that it stands for in the past and present, are less generally known than they deserve to be. There are many natives of Newcastle who have never yet been inside the museum; and few even of those who know its interior are acquainted with the interesting history that lies behind it. This history is regarded by competent outsiders as one of which the district has a right to be proud. An outline of it will be attempted in the present short series of articles, the main object of which is to tell in brief how the museum came into existence, and how it has attained the important position which it is acknowledged by general consent to hold among the provincial museums of Great Britain.

In the first place, however, it is necessary to lay stress on a point which is often overlooked. The Hancock Museum differs from the great majority of institutions of its class in that it is not rate-supported. It is owned and maintained by a private Natural History Society. This fact is a significant one for both the Society and the museum. There are a large number of natural history societies and clubs in the country, but the position occupied by the Natural History Society of Northumberland, Durham, and Newcastle-on-Tyne is in

* A series of articles written by the Curator and published in the *Newcastle Daily Chronicle* in November and December, 1907. Ordered by the Council to be reprinted as an appendix to the Transactions. The portrait blocks are kindly lent by the Editor of the *Chronicle*.

several respects a rather special one. There are few kindred bodies, for example, which make themselves responsible for so large a district. Again, very few have such great traditions to live up to as those which its past history holds before this Society, and of which the succeeding articles will give some idea. But above everything else, it is the museum that most strongly affects the Society's position. The museum is one of its chief sources of strength, and at the same time the cause of most of its difficulties. Without the museum, the membership, small though it actually is, would probably be still smaller; for the museum forms a kind of centre for the Society's existence, and many members look upon their annual guinea as practically a subscription towards museum maintenance. And on the other hand it is the attempt to maintain a museum—a function now generally discharged by the municipal authorities—that puts so severe a strain upon the resources of the Society, and makes so difficult the full carrying out of its aims. The museum is a magnificent possession, but a possession that brings with it a very large responsibility. Many unique collections, brought together by great local naturalists, have been placed there to be preserved for the use of later generations (and it should be understood that their preservation is by no means a passive duty: it involves a large amount of work each year); the building and the grounds have to be maintained; and above all, if so large a museum is to justify its existence at all, it must place before the public in its show cases a systematic series of natural objects, so selected and arranged as to arouse in the casual visitor an interest in nature, and provide an objective text-book, so to speak, for those who come for help and guidance in more serious study.

As for the responsibility involved in the upkeep of this particular museum, it will be sufficiently appreciated by those who are alive to the unique interest and value of such collections as John Hancock's birds, Thomas Bold's Northumbrian insects, Col. C. H. E. Adamson's Burmese butterflies, the beautiful collections of birds' eggs and lepidoptera given

by Mr. Frederic Raine, the herbarium of N. J. Winch (a celebrated Newcastle botanist of the early nineteenth century), and such noted collections of local fossils as those of William Hutton, J. W. Kirkby, and Thomas Atthey. All these, together with much other similar material, illustrate the importance of the Hancock Museum as a scientific storehouse. In its capacity as an institution for guiding and inspiring the ordinary non-technical visitor it has not yet reached anything like the full development of which it is capable, for the simple reason that the Society which owns it has never yet been able to pay for the necessary specimens and the necessary work. It is only within quite recent times in fact that any museum of natural history has taken this side of its duty seriously; and considering that it has had to rely almost entirely on gifts for its material, the Hancock Museum does already put before its visitors a selection of natural objects that is quite remarkable for the degree of completeness with which it represents the marvellous variety of nature. The most important future work of this museum, as of so many others, must lie in the direction of making its contents more self-explanatory, and so more truly educative.

It will be seen that the Natural History Society has its full share of responsibilities; and during the seventy-seven years of its existence it has done a great deal in fulfilment of them. Its activities fall under two main heads, which may roughly be described as public and private. Its public object is the general encouragement of natural history interests in its district. What we are calling by contrast its private object is the special investigation of the local natural history—of the multitudinous elements of the fauna, flora, and geology of Northumberland and Durham. Work under the first head, its public work, has always been limited by the modesty of the Society's resources. Often it has been almost confined to the maintenance of a museum which the public might use and where information could be obtained. This in itself is an important service to have performed, as is proved by the number of people who refer to the Society's museum as having

had a large influence in shaping their tastes in early years; but the Society of the present day desires to do much more. Already it has instituted series of lectures and addresses the value of which is being every year increasingly recognised; and one of its chief aims now is to bring the whole of its museum into such a state that the public, as well as the scientific specialist, may derive from it the maximum of benefit. Considerable progress in this direction has indeed been made, but at present it is hampered at every turn by lack of sufficient funds.

In the public side of its functions, then, there is still much future development to be looked for. In the other chief sphere of work, the investigation of local natural history, the Society has already a record which is probably unequalled by that of any similar body in the country. Almost every section of the local fauna and flora has been worked upon by competent and often distinguished naturalists. The results of their labours are recorded in the Transactions, and in many cases this record is further reinforced by the collections made in the pursuit of their studies and bequeathed by them to the Society. In this way a quite remarkable store of information has been laid up in the course of years. There is probably not another provincial natural history society in Britain that has published such a comprehensive series of authoritative catalogues as those in which the natural history of Northumberland and Durham and of the adjoining waters of the North Sea is dealt with in this Society's transactions.

And happily there is no sign of slackening in this direction. On the contrary, at no period in its history has the output been larger or of better quality than during the last two or three years. Our local butterflies and moths, our local two-winged flies, and our local spiders have all been dealt with in the fullest manner in recent issues of the Transactions, not to mention the numerous other papers concerned with work or discoveries of a more detailed nature. Full catalogues of the local crustacea and beetles—both very large subjects upon which a vast amount of information is already to be found in

the Transactions—are furthermore at present in preparation. And it is pleasant to be able to state that the vigour of the Society and the value of its publications have met, during the past year, with wide and most favourable recognition in the scientific press.

We have, then, in this city a Natural History Society with a long and honourable history behind it, and before it a prospect of service to science and to the public only limited by its material resources. In the investigation of the natural history of its district—a field of work depending on the zeal of its members rather than on the state of its purse—this Society has given remarkable proofs of its vitality. And the general public, from whom a full appreciation of these more technical achievements is not to be expected, have before their eyes, in the shape of the Hancock Museum, an even more striking witness to what the Society has done and intends to do for the cause of natural history in this neighbourhood.

As we have already said, the history of the Museum, though little known in the district, is of great interest, and is associated with many names that will always hold an honoured place in the annals of natural science; and to give an outline of this history will be the main purpose of the succeeding articles.

II.—EARLIER HISTORY OF THE MUSEUM

In a work published a few years ago dealing with the museums of Great Britain, the Hancock Museum at Newcastle was made the text of a chapter upon "what private effort can do." It was thus placed in contradistinction to almost all the other leading museums of the country; and in the preceding article we saw something of the significance of this unique position. For it is practically a unique thing for a museum of any importance to be owned and administered by a private society. Excluding the State museums and a few owned by universities, all our chief natural history

museums—that of Newcastle excepted—are owned and supported by municipalities. It is not that other natural history societies have not formed their own museums. They have done so in quite a number of cases up and down the country. A good many of the museums so founded were taken over by the towns after the passing of the Museums and Gymnasiums Act, or at least formed the nucleus of town museums started at that time. Others, instituted years ago with a good deal of local enthusiasm, are now lingering on in a neglected condition, only too often doing more harm than good to the cause of natural history. Our local society is therefore pardonably proud of its record, and of the fact that its museum stands as practically the only successful instance of "what private effort can do."

As a matter of fact, the "private effort" to which the present form of the museum is due was largely concentrated about the year 1880, and was stimulated chiefly by the energy of the man whose name the museum now bears. But the history of the institution goes back very much further than that—more than a hundred years further in fact. It was about the year 1770 that Marmaduke Tunstall, a young gentleman of fortune and leisure, began to form the private museum which has developed, through many vicissitudes, into the Hancock Museum of to-day. This Marmaduke Tunstall came of an ancient and distinguished family. Sir Thomas Tunstall received the manor of Thurland Tunstall, in Lancashire, from Henry IV., and the family long flourished at Thurland Castle. Scott mentions Brian Tunstall, the "stainless knight," in the sixth canto of Marmion; and Sir Brian's brother, Cuthbert Tunstall, was a celebrated Bishop of Durham at the time of the Reformation. Marmaduke Tunstall himself was the last of the line. He was of literary and scientific tastes, and the collection that he brought together, though particularly rich in birds, included also other objects of natural history and ethnology, as well as a good many antiquities. He began his collecting in London, and afterwards, when he settled at his country seat at Wycliffe on the

The Hancock Museum from the North Road

Tees, he built there a special room to accommodate his museum. He was a patron of Bewick, and it was for him that Bewick engraved his noted woodcut of the Chillingham bull.

MARMADUKE TUNSTALL.
After the portrait in Fox's "Newcastle Museum."

Tunstall died in 1790 at the age of 48, and a year later his museum (known at that time as the Wycliffe Museum) was sold to George Allan, of Blackwell Grange, Darlington. Allan was a distinguished antiquary, an authority on heraldry, and a man of industrious and methodical habits. The care of a museum was an occupation after his own heart. He installed the collection in two large rooms in his house, where the objects were systematically arranged and were all labelled in his beautiful handwriting. The remains of Allan's labels are still adhering to a few of the ethnological specimens in the Hancock Museum. Many additions also were made to the

collection while it was in his hands. He opened the museum to the public, and he characteristically records that in three and a half years it was visited by 7,327 persons.

After his death in 1800, the museum remained at the Grange until 1822, when an important change in its fortunes took place. In that year it was purchased by the Newcastle Literary and Philosophical Society, and became for the first time—what it has ever since remained—the "Newcastle Museum." Under this name it was carefully and elaborately catalogued by the Rev. George Townshend Fox in his "Synopsis of the Newcastle Museum," published in 1827. From this valuable work most of the foregoing particulars of its earlier history have been taken; as are also the following interesting details as to the removal of the collection from Darlington to Newcastle. This, we are told, "was effected by its being most commodiously packed in a frame of wood-work, placed on a spring glass-waggon, which was lent for the purpose by William Cuthbert, Esq., of Benwell, and it arrived safely in Newcastle without the injury of a feather, notwithstanding its encountering on Gateshead Fell one of the highest gales of wind ever known." An obvious reflection suggested by this passage is that it would take many waggons and "frames of wood-work" to move the contents of the museum which has developed out of the one catalogued by Mr. Fox, and this in spite of the fact that nearly all the specimens of that date have long ago been superseded. Practically all that survive in the museum of to-day are a few stuffed birds which served Bewick as models for his woodcuts, and some extremely valuable native implements from New Zealand and the South Seas. These are all now marked on their labels as being from the "Allan Museum."

The home of the museum thenceforth for sixty years was a set of rooms adjoining the Literary and Philosophical Society's premises at the bottom of Westgate Road. For a few years it was under the direct ownership and management of that society. But when, in 1829, an offshoot was formed under the title of the Natural History Society of Northumberland,

Durham, and Newcastle-on-Tyne, this new society took over the museum, and has been responsible for its maintenance ever since.

The Society began its career under good auspices. Among its original members were several naturalists whose names and works were known in the scientific world throughout Britain, and even beyond. Perhaps the best known of all was P. J. Selby, of Twizell House, in the north of Northumberland, one of the most celebrated of the earlier ornithologists. Another, Nathaniel J. Winch, was a noted botanist. In days when travel, even in one's native land, was a serious undertaking, he had thoroughly explored the northern counties of England, and his great work, "The Botanist's Guide to Northumberland and Durham," was considered—and was—a remarkable achievement. The greater part of his very fine herbarium is still preserved in the museum. Other celebrated naturalists who were original members of the Society were W. C. Hewitson, Dr. George Johnston of Berwick, Joshua Alder, and Albany Hancock. Sir Walter Trevelyan and Sir Matthew White Ridley were two of the original vice-presidents. The first president was the Bishop of Durham, Edward Maltby.

In the council room at the museum there is a very interesting memorial of the early days of the Society. It is the certificate of membership of William Backhouse, a good naturalist of that time living in Weardale, and it bears the signature of the bishop as president, and of William Hutton and George Wailes as secretaries. Hutton was a geologist, joint author of Lindley and Hutton's "Fossil Flora,"' a work which is one of the foundations of the science of fossil botany. A large part of the material for this classical book was collected by Hutton in the Newcastle district, and especially at the old Jarrow colliery. His collection, like all assemblages of early "type specimens," is of extreme scientific value; it was given to the Society in 1883 by the Mining Institute of Newcastle, and forms one of the most important treasures of the museum. Hutton's co-secretary, George Wailes, was the

chief authority of his day on the local butterflies and moths. He was a brother of William Wailes, the celebrated artist in stained glass.

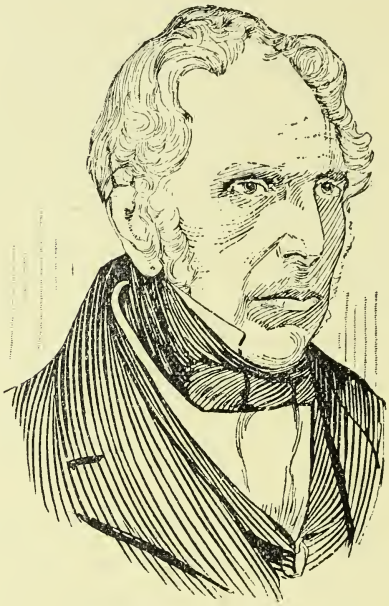
It has already been mentioned that Bewick made use of some of the birds in the old collection. His connexion with the museum seems to have extended over a considerable period. He at least corresponded with Marmaduke Tunstall; he used to visit George Allan, at Darlington, in order to make drawings of the specimens; and he continued to use them in the same way after they came to Newcastle. A group of the old "Allan Museum" birds, together with Bewick's figures of them, are now shown on the "Bewick Gallery" in the museum; they were probably thought satisfactory when they were stuffed, more than a hundred years ago, but to us now they look very distorted, and even in Bewick's woodcuts they have undergone much "editing."

The middle period in the history of the Society and its museum, from about 1840 to 1880, was one in which a great amount of solid work was done and recorded, and in which the museum collections increased till they had quite outgrown the space available for them in the Westgate Road premises. Some of the principal contents of the museum in its early days have already been mentioned incidentally. During these forty years the collections in all departments were gradually growing, partly through the continual small acquisitions which are normal to the life of a museum, and partly also through occasional larger and more important gifts. In 1837, for example, the Earl of Tankerville presented a beautiful collection of corals (and it may be mentioned that these have recently been cleaned and re-installed on a new system, so that they are now seen better than they have ever been before). The Emperor Nicholas I. of Russia was induced, in 1838, through the good offices of Lord Durham, to send to the Society a representative series of the minerals of the Russian Empire; Hutton's excellent collection of minerals was purchased for the museum by Sir William Armstrong in 1859; and when subsequently, in 1872, there was added to these the

fine collection presented by Mr. Norman Cookson, the museum came to possess a particularly rich mineralogical section. But equally important gains were made in other departments. By a process similar to that which took place with the minerals, an excellent collection of shells was got together; and the series of fossils, in the same way, gradually became more and more fully representative, not only of the local rock-beds, but of the geological succession of England as a whole. Many interesting additions were made by various donors to the ethnological collection. For instance it was at this period that the precious examples of Hawaiian feather-work and the Esquimo kayak and hunting outfit were presented. The history of the kayak referred to is also that of a number of other interesting objects in the museum: it was brought back by one of the whaling ships which in the earlier part of last century used to sail every year from the Tyne, as from nearly all the ports on the east coast.

In most museums of importance and old standing there is a valuable section of the contents that is not seen by the casual visitor; this section is composed of the "reference collections"—sets of specimens too full and detailed for exhibition to the public, and preserved in drawers and cabinets for the use of specialists. The Hancock Museum is particularly rich in these reference collections. The majority of them have been acquired since the founding of the new museum, but several date back to the period we are considering. Such, for instance, are the fine collection of British shells and zoophytes formed by Joshua Alder, T. J. Bold's collection of local beetles and other insects, and the reference herbarium of British plants selected and arranged by Prof. Daniel Oliver. The last-named naturalist, for many years one of the chief officials at Kew, was a local man, and was formerly an active member of the Society; he is still one of its few honorary members. T. J. Bold lived at Benton; he had an unusually good knowledge of several orders of insects, both of his own district and of Europe. Joshua Alder was one of the best naturalists ever connected with the Society. Most of his work was done in

conjunction with John Hancock's brother Albany, and the joint authors, "Alder and Hancock," hold a classic position



Joshua Alder.

among the authorities on marine natural history. Their most noted work was a splendid monograph on the nudibranchs or sea slugs of Britain, published sixty years ago by the Ray Society. The same Society has lately published as a posthumous work another important monograph, on the British tunicates, which on the death of the authors was left not quite completed. The museum possesses most of the drawings and specimens used for these and numerous other works of "Alder and Hancock"; and no one visiting the museum should miss seeing Albany Hancock's exquisite original drawings of sea slugs on the gallery of the zoology room.

It is quite impossible, in a condensed account such as this, to give an adequate idea of the merits of these men; it must suffice to say that Joshua Alder and Albany Hancock are two

of the men whose gifts and labours have done most to shed lustre upon the past history of the Newcastle Natural History

ALBANY HANCOCK.

Society. But they were by no means isolated workers. Associated with them was a distinguished group of local naturalists, of whom two, Prof. G. S. Brady, late of Armstrong College, and Canon Norman, are happily still spared to carry on the great traditions of the past. H. Bowman Brady, brother of the professor, and one of the first authorities on the foraminifera, died eighteen years ago, when a career of distinction both in business and science seemed open before him. There were a number of others among the earlier members of the Society whose names are honourably remembered in the annals of local natural history; but space cannot be found here to refer to them.

III.—JOHN HANCOCK AND THE NEW MUSEUM

In the preceding article the history of the Museum was followed in outline from its origin in the eighteenth century down to about twenty-five years ago. The early eighties, the point thus reached, marked a most important epoch for the museum. It was then that the decision was finally taken to

build a new museum. The project was, on the face of it, beset with difficulties, and the credit for the surprising success with which it was eventually carried out is incontestably due in the main to the energy of one man, John Hancock.

JOHN HANCOCK.

No account of the museum could well be given without some reference to John Hancock, one of the notable men that Newcastle has produced. Born in 1808, in a house at the north end of the Tyne Bridge, he inherited from his father a keen love of nature, and his whole life was devoted to his favourite pursuits, especially to the study of birds. As a practical ornithologist his reputation, in spite of his retiring disposition, came to be of the very highest order. Fortunately for his contemporaries and successors he took to taxidermy, so that much of his knowledge and experience finds a material embodiment in his wonderful collection; and being a born artist as well as a close observer, he soon began to achieve successes such as had not been dreamt of previously, and which did much to raise the general level of the bird-stuffer's

art. His talents, however, were little known outside his immediate circle of friends, until in 1851 he sent up some masterly studies of birds of prey to the Great Exhibition in Hyde Park. These studies will be found among the groups in pedestal cases in the bird room at the museum; they are the laemmergeier or bearded vulture, and the three illustrations of falconry. The number of those who can fully appreciate any branch of art dealing with animal forms is unfortunately small, but in London it was at once recognised by the best judges that these works of Hancock's were on a higher level than anything that had been achieved before; and from that time his fame as a taxidermist steadily grew.

John Hancock's great life work was the formation of the magnificent collection of British birds which now constitutes the most celebrated feature of the museum. It is undoubtedly the finest and most complete collection of British birds to be seen anywhere. It is especially remarkable for the fulness with which all the different and puzzling stages of plumage are represented—an important matter, because it is precisely about these odd stages of plumage that information is most often wanted. A number of the individual specimens also are of special interest to ornithologists, as being the first, or almost the first, of their kind recorded from Britain, or as having formed the subject of original observations now become classic. Another particularly valuable point about the collection is the life-like manner in which Hancock has succeeded in reproducing the character, form, and attitude of the birds. The birds of prey especially—these were always his favourite study—are an admirable series in every respect.

Many birds in the collection recall the former ornithological glories of Prestwick Carr. This expanse of water and marsh, which used to cover the low land to the east of Ponteland, was one of John Hancock's favourite haunts. It is now almost completely drained and cultivated. Hancock did not, however, confine himself entirely to his native district. As a young man he made two long tours, in Norway and Switzerland, with his friend W. C. Hewitson, enlarging thereby the

horizon of his knowledge of the bird world. He was also a frequent visitor at the house of Charles St. John, the author of that classic book "Wild Sports of the Highlands." When Hewitson died in 1878, he bequeathed to John Hancock his beautiful house and grounds at Oatlands, near Weybridge, on the Thames, and for the remainder of his life Hancock and his sister used to spend the summer there; the locality, "Oatlands, Surrey," like "Prestwick Carr," appears on the label of many specimens in the museum.

On the death of his brother Albany, in 1873, it was proposed to raise some sort of memorial to his memory, and John Hancock suggested the foundation of a new museum for the overcrowded collections of the Society. The idea for the time being was allowed to drop, but in 1879 it was taken up again with determination, and this time it was carried through. An opportunity occurred for obtaining the ground on which the museum stands to-day, overlooking Barras Bridge. Hancock set his heart on securing this admirable site, and his friend Col. John Joicey, with singular generosity, purchased it and presented it to the Society. There could now be no going back. But the scheme of the new museum as Hancock had conceived it was an ambitious one, and a man of less energy and enthusiasm might well have despaired of seeing it realised. As a matter of fact, the building and interior fittings eventually cost over £40,000. That it was possible at all to raise such a sum by voluntary subscription was a striking testimony to the esteem in which Hancock was held among his many friends; the bulk of the money was indeed promised to him privately before any appeal was made to the general body of members of the Society. He had offered to present to the museum his whole collection of birds, if the building could be erected according to the plan he had sketched out; and the desire to secure a permanent resting-place for such a monumental life-work in the locality where it properly belonged was naturally a great stimulus to subscriptions. It may be of interest to name some of the chief subscribers to whom the Natural History Society, and

indirectly the town and district, owe this fine institution. Col. Joicey not only bought the site, but made a large donation to the building fund, his total contribution amounting to £12,000. His brother, the late Edward Joicey, gave £4,000. The late Lord Armstrong, always a liberal patron and for many years president of the Society, was also keenly interested in the scheme, and subscribed £10,000 to the fund, Lady Armstrong adding nearly £4,000 more. W. C. Hewitson had bequeathed a sum of £3,000; Sir Lowthian Bell gave £1,000. The appeal for subscriptions was nobly responded to also from among the rest of the members, and by others who became interested in the project, a further sum of about £5,000 being thus raised. Finally, the sale of the old building to the North Eastern Railway Co. for £12,830, left a balance of £2,000 to be invested towards maintenance.

This, then, was how the "new museum" on Barras Bridge—it was only after John Hancock's death in 1890 that it was named the "Hancock Museum"—came to be built. Hancock set to work without delay to install his birds in the central room; and gradually the contents of the old museum were transferred, section by section, to their new quarters, and arranged there. The new museum was opened to the public on August 20th, 1884. By the express desire of Lord Armstrong, the opening ceremony was performed by the Prince and Princess of Wales, now King Edward and Queen Alexandra. Five years later the British Association held its meeting in Newcastle, and the president of that year, Professor (later Sir William) Flower, the director of the Natural History Museum at South Kensington and one of the first museum experts of the world, spoke with the greatest enthusiasm of the institution, congratulating the Society and the district on its possession, and especially on having secured in such a satisfactory way the fruits of John Hancock's unique talents and labours.

Indeed there were abundant grounds for congratulation, and the Society was naturally and justly proud of its splendid new property. Another aspect of proprietorship, however, soon became prominent—the increase of responsibility involved

in increased possessions. In the first report published after the opening of the new museum the committee emphasise the need for a larger roll of annual subscribers, in order to "enable them to complete the arrangements of the museum collections, which at present the annual income of the Society will not enable them to do." This was written twenty years ago, and still, though much has been done in the meantime, the arrangements referred to are uncompleted. The annual income of the Society has not risen, or such slight rises as have taken place in some years have been counterbalanced by losses in others; and an effort to raise capital for a substantial maintenance fund produced a very small result. It has consequently never been possible to employ a staff capable of dealing at all adequately with the work that was needed. Although the Hancock collection of birds was fitted up in a more or less final manner, the rest of the museum was for the most part only "roughed out," and owing to the Society's poverty most of it has had to remain so. The possibilities and prospects of a better state of things will be spoken of in the final article.

It will be seen, then, that the satisfaction of the Natural History Society in the great possession which it secured twenty-three years ago has not been without its clouds. But one feature at least of the period which has elapsed since the opening of the new museum has been gratifying in the extreme; many most important gifts have been received, so that the collections have largely increased in value. It will only be possible here to mention a few of the largest of these gifts. Mr. Fredc. Raine, formerly of Durham, has provided the Society with admirable collections of British birds' eggs, British butterflies and moths, and Continental butterflies, all very great acquisitions, and marked, like everything that Mr. Raine undertakes, by thoroughness and exquisite workmanship. Col. Adamson, in addition to other gifts, has presented his fine collection of the butterflies of Burma, the result of thirty years' work in that country. A collection of local Diptera or two-winged flies, formed and presented by the Rev. W. J. Wingate, of Bishop Auckland, is of particular

value, because Mr. Wingate is the only serious student and collector of the Diptera in the North of England; and a large volume written by him and published last year by the Society forms the only introduction in English to the study of these insects. To Mr. Geo. E. Crawhall the museum has been indebted for many additions to the bird collection, for some excellent examples of British mammals, and some good ethnological objects. Other large additions to the ethnology gallery have been made by Mr. George Allan, of Gateshead, and the Rev. R. Stewart Wright; these two donors between them have practically equipped the African section of the gallery.

Extremely valuable acquisitions have also been made in the section devoted to fossils. Hutton's classical collection of coal measure plants was referred to in a previous article; it was presented by the Mining Institute of Newcastle while the new museum was being fitted up. Near it in the

THOMAS ATTHEY.

same room is another noted set of fossils, the Atthey collection of fish and amphibian remains from the shale above the Low Main seam at Newsham Colliery. This bed of shale yielded a surprising abundance of interesting and unique fossils, and

it was most fortunate that a man of such patience and enthusiasm as Thomas Atthey was found to exploit it. Atthey was a grocer at Gosforth; and when he fell upon hard times his fossils were purchased and presented to the Society by Lady Armstrong. The other great local rock formation, the Magnesian Limestone, is also represented very fully in the museum. In the store of material from this formation, an important element is constituted by the collection of the late J. W. Kirkby, who was a local man, and an authority on the geology of this and other districts. Other well known local geologists who have made large contributions to the collections are Prof. Garwood, the late Jos. Duff of Bishop Auckland, the late T. P. Barkas, and the late Wm. Dinning; and there are several more whose names are less familiar in this district—for example Dr. Dew Smith, J. Goring, W. K. Loftus—but to whom is largely due the completeness of the geological section of the museum.

The list of valuable acquisitions made at or since the time when the new museum was founded might be extended almost indefinitely; indeed, if a census of the contents of the museum were taken, it would be found that an astonishingly large proportion of them dated from the years 1883–8. We must conclude this article, however, with a reference to only one further example, but that an important one—namely the Bewick collection. It occupies most of the gallery of the zoology room, and consists of original drawings, proofs of the woodcuts, and some portraits of great value. For this splendid collection we are indebted to Mr. Joseph Crawhall and Mr. John Weldon Barnes, the executors of Miss Jane Bewick, last surviving daughter of the celebrated wood engraver. By her will Miss Bewick gave absolute discretionary power to her executors as to the final disposal of the works of her father. Proposals were made to send the collection to the British Museum; but the executors wisely decided that the most fitting resting-place for it was the museum of Bewick's native town.

IV.—THE MUSEUM AS IT IS TO-DAY

The preceding articles have given in outline the history of the Hancock Museum—a very slight outline in many respects, but sufficient, perhaps, to show why outside observers have considered the record to be one of which the town and district should be proud. The object of this final article will be to sum up the present position and prospects of the museum and of the Society which owns it.

First, however, must come a few lines of matter belonging more properly to previous articles. There have already been mentioned a considerable number of names honourably connected with the museum in the past, and there are some half-dozen more which cannot be omitted from any account of the institution. William Chapman Hewitson has been referred to

W. C. Hewitson.

incidentally, but hardly in such a way as to convey an idea of his standing as a naturalist. As a matter of fact he was one of the very highest authorities of the middle of last century both upon the birds' eggs and the butterflies of the world. A man of wealth and leisure, but also of great industry and

remarkable manual skill, he accomplished an astonishing amount of work, which he published in beautifully illustrated monographs. His collections went to the British Museum, but he bequeathed his valuable library to the Natural History Society. One book in his library is particularly noteworthy. It is entirely the work of his own hand, and depicts in an exquisite manner the wing-patterns of nearly all the known butterflies of certain groups from all parts of the world. Hewitson was one of the members of the "Wednesday Evening Club," an informal precursor of the Natural History Society in the "twenties" of last century: among the other members were the two Hancocks, Winch, and Joshua Alder.

The late Charles Murray Adamson, of Crag Hall, North Jesmond, was an ornithologist of unusual ability. He acquired a wonderfully exact knowledge of the changes of plumage of birds, especially in the groups where they present the greatest difficulty—the ducks and waders. He also became a skilled taxidermist; certainly no one ever more perfectly caught and reproduced the charming form and carriage of the wading birds than he did. His mastery in this respect is almost as great as that of his friend John Hancock in the case of the birds of prey. Reference must also be made to the devoted labours of a past honorary secretary of the Society, the late William Dinning; he had a good knowledge and a good collection of local fossils, and it was he who used to maintain in such fine order the rock garden in the museum grounds. The late Dr. Embleton was another prominent member of the Society and an intimate friend of the Hancock brothers, both of whom he assisted in a variety of ways in their work. The former curator of the museum, the late Richard Howse, was a man of many parts. He had a particularly good knowledge of local fossils and geology, and he prepared what scientific naturalists term "critical catalogues" of several collections in the museum, thereby considerably enhancing the reputation of the Society's publications. One other name inseparably associated with the history of the museum must on no account pass unnoticed—that of Mr. Joseph Wright, who for over half

The Bird Room at the Hancock Museum

a century filled the position of keeper of the museum. On his retirement three-and-a-half years ago, Mr. Wright's faithful services were gratefully and publicly acknowledged by the Society; and as honorary keeper he still continues to give the staff the benefit of his great knowledge of everything that concerns the institution and its traditions.

In this article it will perhaps be useful to summarise very rapidly some of the most noteworthy features of the Hancock Museum as it stands to-day. Many of them have been alluded to already, but from the chronological account it will scarcely have been possible to form a connected view of the whole. The most celebrated section of the museum is, of course, that devoted to birds, and the special glory of that section is John Hancock's collection of the birds of Britain. In the general zoology room there are collections representing all divisions of the animal kingdom, but at the present moment the different portions are of very unequal merit. The collections of shells and of corals are excellent; good material is also in hand for several other divisions, and these are being brought into good order as rapidly as means will allow. The geological department, though less attractive to the public, is as celebrated among specialists as the birds; in addition to a very good general series of fossils from rock-beds of all ages, this department contains the noted collections of local fossils referred to in previous articles—the Hutton Collection of Coal Measure plants, the Atthey Collection of Coal Measure fishes and amphibians, and the fine series of fossils from the local Magnesian Limestone. Visitors to the museum must not imagine, however, that the fossil room in its present form represents what those responsible for it would like it to be. The material is very good, but a vast amount of work will have to be expended upon it before it is so exhibited as to make the most of its excellencies and teach all that it might teach. Another section which may be regarded as one of the "strong points" of the museum is that of the minerals; it is certainly unusual to find such a series in a provincial museum. The collection of Bewick's woodcuts and drawings is one the

value and interest of which do not need emphasising. In the upper east corridor is an ethnological collection. Perhaps strictly speaking ethnology should hardly find a place in a museum of natural history, but the inclusion of the section is justified not only by the appeal that it makes to the public, but also by the historical fact that an ethnological section has formed part of the museum from its earliest days under Marmaduke Tunstall. It is just this fact that lends such special value to some of the objects in the section—as, for instance, those from New Zealand and the South Seas; for having been obtained from the natives at such an early date, they represent their arts and customs uncontaminated by European influence. There are even grounds for thinking that a good many of the "Allan Museum" objects were obtained in the expeditions of Captain Cook. Finally, in summing up the leading features of the museum of to-day, we must not forget its rich store of reference collections, including as they do particularly fine sets of birds' eggs, butterflies and moths both British and foreign, British insects of other orders, British shells and zoophytes, and of flowering plants, cryptogams and seaweeds—not to mention a number of others which appeal chiefly to specialists.

The Hancock Museum, in virtue of all these special features, has in a high degree what we may describe as individuality. This quality is well worth preserving, since it is by no means desirable that all museums of natural history should be alike. The best museum experts have always recommended that different museums should specialise along different lines. And this valuable quality of individuality, in the case of the Hancock Museum, is directly traceable to an advantage which it has over the majority of similar institutions in the provinces: it is a museum of old standing. The Hancock Museum of to-day is the heir of a long and in many ways distinguished past.

Whilst the attempt has been made in these articles to point out the characteristic merits of the museum and to show how they came into being, no secret has been made of the fact

that there is still room for many improvements. It might almost be said, indeed, that those responsible for the maintenance and management of the institution are more conscious of what is still to be done than of what has been done already. It was seen in a previous article that on the original installation of the new museum in the eighties the bulk of the collections were only "roughed out" in their positions in the cases, and that the committee of that day having failed to find the means for the necessary work, a considerable part of the collections had had to remain in that condition. This is the reason, for instance, for the comparatively backward condition of parts of the zoology room, the collection of rocks, and nearly the whole of the fossil room; the material is there, but it has not yet been possible to exhibit it to proper advantage. It is true that during the last few years a good deal has been done towards overtaking these heavy arrears of work. The ethnology gallery has been entirely re-organised; the shells and several other sections in the zoology room have been put into good order; much work has been expended on the bird room, and improved methods of exhibition and labelling have been introduced in several other parts of the museum. But the arrears to be made up are still overwhelming. In the fossil room alone there is three or four years' solid work for an expert, and with the present staff this practically cannot be touched.

It must be borne in mind, too, that the overtaking of these arrears, though under present conditions it appears discouragingly distant, is after all only the first step. The collections have been roughed out on a good system, and the first thing is to get them into finished order as they stand. But the developments that would be possible after that are among the most useful and desirable of all. The nature of these contemplated further developments may be gathered to a slight extent from a small beginning that has been made in the fossil room. The large sets of fossils filling the cases in this room cannot be expected to convey an intelligible lesson to the uninstructed visitor, and so a range of small intro-

ductory cases is being prepared, each one containing a simple account of one geological period, illustrated by a few selected specimens. Some day there should be similar introductory cases in nearly every department of the museum, designed to help visitors to a better understanding of the collections as a whole. And an even more valuable, and in the best sense popular development, would be the introduction of "topical" cases—groups of specimens, fully described, illustrating such subjects as protective mimicry, nesting habits, methods of locomotion, damage and benefit to crops. Now even as it stands the Hancock Museum is capable of being used not only as a place of reference for skilled naturalists, but also as a most valuable accessory to education, as well as a general means of encouraging an interest in natural history. When the first step, the better display and helpful labelling of the "roughed out" portions, is accomplished, it will naturally serve these ends very much better. When, finally, it has been developed on the lines suggested above, that is to say when all that is possible has been done to make it both attractive and self-explanatory, the good influence of the museum as an educational factor and as a means of stimulating a healthy interest in nature will be beyond calculation.

And it will be in the soberest economical sense a mistake if the museum does not undergo such a development. It is in fact a mistake that it should not be approaching it more rapidly now. So much has been done already that to allow the work to remain incomplete is like "spoiling the ship for a ha'porth of tar." The enthusiasm aroused by John Hancock has provided a fine building on an admirable site, and a succession of gifted naturalists of the north-eastern counties—Hancock himself, Joshua Alder, Mr. Fred Raine, and all the others we have spoken of—have endowed the museum with the results of their life-long labours. After all this, in a locality which twenty-five years ago honourably distinguished itself by the generous send-off which it gave to the new museum, it would surely be pathetic if the same museum were allowed to remain permanently but half developed through subsequent lack of support.

The Natural History Society has done its best to fulfil the important charge it has undertaken. People associated with the management of other large museums have been astonished at the amount that has been accomplished on such a slender income.* One sometimes hears that more support would be forthcoming in the district if the public knew more about the museum, and especially if it were more generally realised that it is supported by a private Society and therefore dependent on voluntary help. If want of knowledge on these matters is really one of the causes of the institution's difficulties, it may perhaps be hoped that good will result from this attempt to outline its history. There can be no doubt, at any rate, that its full history is known to comparatively few, and it can hardly fail to interest some to whom the museum building is a familiar landmark.

* The average annual expenditure on the present museum since its opening has been £760. A museum of its size and importance would ordinarily be expected to cost between £1,500 and £2,000 a year to maintain, and it is very probable that the Hancock Museum could not be maintained at the same level of efficiency as other first-rate provincial museums at a less cost. Taking our present position as a basis, however, it would seem that with an additional £300 a year available for salaries and £150 or £200 for specimens and fittings (*i.e.*, with an annual income of £1,200 to £1,300) we should be able to make steady and satisfactory progress towards such a development of the museum as is outlined in the preceding pages.

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